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DOT HS- 805 201

# REPEATABILITY OF VISIBILITY TESTS

E. Enserink

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Dynamic Science Incorporated  
Talley Industries Company  
1850 West Pinnacle Peak Road  
Phoenix, Arizona 85027

Contract No. DOT HS-8-01967  
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October 1979  
FINAL REPORT

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16. Abstract			
<p>The purpose of this project was to provide information on current production vehicles concerning repeatability in making measurements of obstructions to visibility and in making measurements of the fields of view through the rear view mirror system. The following three vehicles supplied by the Motor Vehicle Manufacturers Association were tested in the program:</p> <ul style="list-style-type: none"> <li>● International Harvester Diesel Tractor Transtar 4300</li> <li>● Ford Econoline Van E-100</li> <li>● AMC Concord 4-Door Sedan</li> </ul> <p>Each vehicle was tested three times. The tests were conducted as prescribed in the National Highway Traffic Safety Administration's proposed standards on "Fields of Direct View" (Docket 70-7, Notice 5), and "Rearview Mirror Systems" (Docket 71-3a, Notice 4). For the rearview mirror systems, only the ambinocular fields of view were measured.</p> <p>In general there was good repeatability on the direct fields of view measurements. Minor difficulties were encountered in positioning some of the mirrors repeatably.</p>			
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## METRIC CONVERSION FACTORS

### Approximate Conversions to Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol	When You Know	Multiply by	To Find	Symbol
<u>LENGTH</u>								
in	inches	*2.5	centimeters	cm	mm		inches	in
ft	feet	30	centimeters	cm	cm		inches	in
yd	yards	0.9	meters	m	m		feet	ft
mi	miles	1.6	kilometers	km	km		yards	yd
<u>AREA</u>								
in <sup>2</sup>	square inches	6.5	square centimeters	cm <sup>2</sup>	cm <sup>2</sup>		square inches	in <sup>2</sup>
ft <sup>2</sup>	square feet	0.09	square meters	m <sup>2</sup>	m <sup>2</sup>		square yards	yd <sup>2</sup>
yd <sup>2</sup>	square yards	0.8	square meters	m <sup>2</sup>	m <sup>2</sup>		square miles	mi <sup>2</sup>
mi <sup>2</sup>	square miles	2.6	square kilometers	km <sup>2</sup>	km <sup>2</sup>		acres	ha
<u>MASS (weight)</u>								
oz	ounces	28	grams	g	g		ounces	oz
lb	pounds	0.45	kilograms	kg	kg		pounds	lb
	short tons	0.9	tonnes	t	t		short tons	t
	(2000 lb)							
<u>VOLUME</u>								
tsp	teaspoons	5	milliliters	ml	ml		fluid ounces	fl oz
Tbsp	tablespoons	15	milliliters	ml	ml		pints	pt
fl oz	fluid ounces	30	milliliters	ml	ml		quarts	qt
c	cups	0.24	liters	l	l		gallons	gal
pt	pints	0.47	liters	l	l		cubic feet	ft <sup>3</sup>
qt	quarts	0.95	liters	l	l		cubic yards	yd <sup>3</sup>
gal	gallons	3.8	cubic meters	m <sup>3</sup>	m <sup>3</sup>			
ft <sup>3</sup>	cubic feet	0.03	cubic meters	m <sup>3</sup>	m <sup>3</sup>			
yd <sup>3</sup>	cubic yards	0.76	cubic meters	m <sup>3</sup>	m <sup>3</sup>			
<u>TEMPERATURE (exact)</u>								
°F	Fahrenheit temperature	5 / 9 latter subtracting 32)	Celsius temperature	°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F

\*1 in = 2.54 cm exactly. For other exact conversions and more detailed tables, see NBS Mon. Publ. 288, Units of Weights and Measures, Price \$2.25, SD Catalog No. C13.10 236.

### Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol	When You Know	Multiply by	To Find	Symbol
<u>LENGTH</u>								
in	inches	8	mm	in	mm	0.04	inches	in
cm	centimeters	7	cm	in	cm	0.4	inches	in
m	meters		m	ft	m	3.3	feet	ft
km	kilometers		km	yd	km	1.1	yards	yd
				mi	km	0.6	miles	mi
<u>AREA</u>								
cm <sup>2</sup>	square centimeters	6	square centimeters	cm <sup>2</sup>	cm <sup>2</sup>		square inches	in <sup>2</sup>
m <sup>2</sup>	square meters		square meters	m <sup>2</sup>	m <sup>2</sup>		square yards	yd <sup>2</sup>
ha	hectares		square kilometers	km <sup>2</sup>	km <sup>2</sup>		square miles	mi <sup>2</sup>
			hectares (10,000 m <sup>2</sup> )	ha	ha			
<u>AREA</u>								
cm <sup>2</sup>	square centimeters	16	square centimeters	cm <sup>2</sup>	cm <sup>2</sup>		square centimeters	cm <sup>2</sup>
m <sup>2</sup>	square meters	17	square meters	m <sup>2</sup>	m <sup>2</sup>		square meters	m <sup>2</sup>
ha	hectares	18	square kilometers	km <sup>2</sup>	km <sup>2</sup>		square kilometers	km <sup>2</sup>
		19	hectares (10,000 m <sup>2</sup> )	ha	ha			
<u>MASS (weight)</u>								
g	grams	9	grams	g	g	0.035	ounces	oz
kg	kilograms	10	kilograms	kg	kg	2.2	pounds	lb
t	tonnes	11	tonnes (1000 kg)	t	t	1.1	short tons	t
		12						
<u>VOLUME</u>								
ml	milliliters	9	milliliters	ml	ml	0.03	fluid ounces	fl oz
l	liters	10	liters	l	l	2.1	pints	pt
l	liters	11	liters	l	l	1.06	quarts	qt
m <sup>3</sup>	cubic meters	12	cubic meters	m <sup>3</sup>	m <sup>3</sup>	0.26	gallons	gal
m <sup>3</sup>	cubic meters	13	cubic meters	m <sup>3</sup>	m <sup>3</sup>	35	cubic feet	ft <sup>3</sup>
m <sup>3</sup>	cubic meters	14	cubic meters	m <sup>3</sup>	m <sup>3</sup>	1.3	cubic yards	yd <sup>3</sup>
		15						
<u>TEMPERATURE (exact)</u>								
°C	Celsius temperature	32	Celsius temperature	°C	°C	98.6	Fahrenheit temperature	°F
		0				37		
		20				37		
		40				37		
		60				37		
		80				37		
		100				37		
		212				37		
		220				37		
		230				37		

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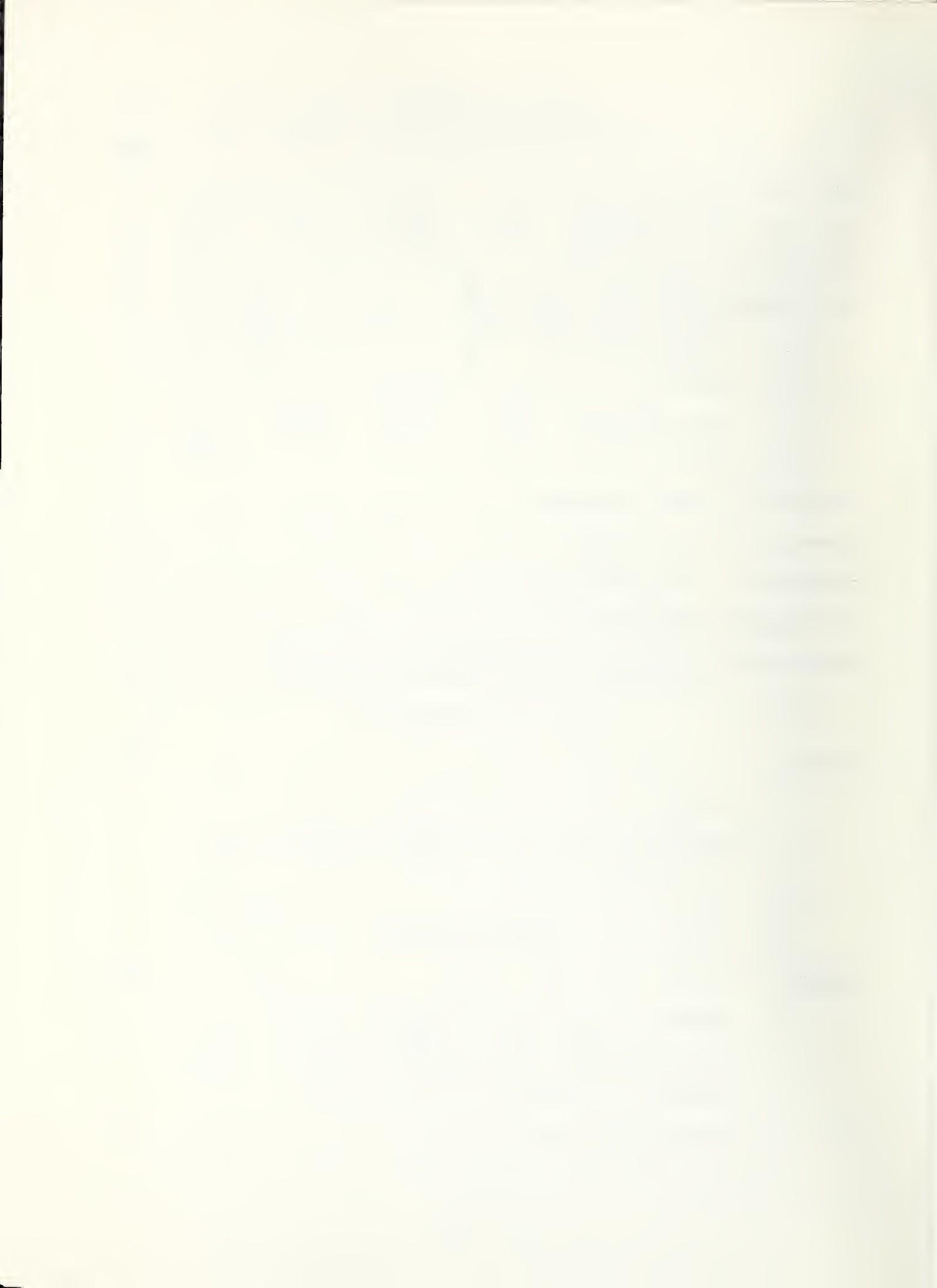
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## 1.0 INTRODUCTION

This report documents results obtained in visibility tests conducted on three vehicles supplied by American Motors Corp., Ford Motor Corp., and International Harvester Corp. through the Motor Vehicle Manufacturer's Association. The tests were conducted as prescribed in the National Highway Traffic Safety Administration's proposed standards on "Fields of Direct View" (Docket 70-7, Notice 5), and "Rearview Mirror Systems" (Docket 71-3a, Notice 4). For the rearview mirror systems, only the ambinocular fields of view were to be measured according to the contract work statement.

The purpose of this project was to provide information on current production vehicles concerning repeatability in making measurements of obstructions to visibility and in making measurements of the fields of view of the rearview mirror system.

The following three vehicles were tested in this program:

- International Harvester Diesel Tractor Transtar 4300
- Ford Econoline Van E-100
- AMC Concord 4-Door Sedan

This report is organized as follows: Section 2.0 provides a description of the facility; Section 3.0 summarizes highlights of the procedure; Section 4.0 presents a summary of the results; Appendix A provides a detailed description of the test procedure; and Appendices B, C, and D present detailed results and photographs for tests pertaining to the AMC Concord, Ford Econoline, and IHC Tractor, respectively. Appendix E provides photographic documentation of measurements made to determine repeatability in setting up the vehicle and in adjusting the mirrors.

## 2.0 FACILITY DESCRIPTION

To minimize setup time for each test, a permanent reference system was constructed within which each vehicle was properly positioned. The sighting equipment was also positioned relative to the reference system, thus reducing the number of measurements required for each vehicle, and likewise the cumulative error.

The reference system consists of:

- A gridded concrete pad with cartesian coordinates of one-foot increments in both directions. For each point in the grid a corrected elevation value was determined and plotted. This allows for a more accurate and consistent method of positioning the vehicle.
- A longitudinal centerline permanently marked on the concrete pad.
- A forward reference station having horizontal and vertical scales and located in a plane perpendicular to the pad centerline.
- A side reference station having a horizontal scale for measuring the longitudinal position.
- A rear reference station consisting of a 6-inch diameter vertical post.

The sighting equipment consists of a mounting fixture (see Figure 1) and supports, four sets of mounting plates, and an optical reading transit (theodolite) (see Figure 2). For rearview mirror tests, a fixture was built to properly position the camera (see Figure 3). A crossbar extending through the windows was used for measuring direct fields of view in the AMC Concord and Ford van. This fixture was used in the van and passenger car for direct fields of view only because the crossbar interfered with the rearview mirror measurements. This arrangement was not used at all in the IHC, because of positioning difficulties.



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Figure 1. Pedestal Support Attached to Seat Base (With P-Plate Attached to Fixture Reference Plate).



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Figure 2. Theodolite With P- and E-Plates as Configured for Binocular Obstruction Measurements.



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Figure 3. Camera Setup for Rearview Mirror Measurements.

For indirect fields of view and for all measurements on the IHC tractor, a pedestal support attached to the seat structure or floor was used. The pedestal support holds the sighting apparatus at the required position relative to the vehicle reference planes. The positioning plates support the theodolite at the prescribed location for the monocular, binocular, viewing area measurements, and ambinocular field of view measurements.

Five positioning plates were fabricated to correctly position the theodolite sight tube at the monocular (V1 and V2), binocular and ambinocular eyepoints. These plates are mounted on spacers above a reference plate attached to the mounting fixture. Thus, when the V2 plate is mounted on the reference plate, it will position the theodolite at the V2 elevation. The V2 plate can be adjusted in the X (longitudinal) direction to correct for seat back angle and H-point travel. The V1 plate mounts on the V2 plate and raises the theodolite three inches to the V1 height. The V1 plate has three additional mounting holes spaced laterally 3, 6, and 9 inches from the V1 position. The theodolite is placed in these holes to project points in a horizontal line on the windshield in order to lay out the prescribed view areas. For binocular measurements, the theodolite can be mounted in each of the eye reference points on the E plate. The E plate can be fixed parallel to the vehicle centerline or rotated about one of two pivot (P) points. This setup was illustrated in Figure 2.

The theodolite has 360° horizontal and vertical circles with a maximum reading error of one-half minute. Four short focus objective lenses were required to focus on the close obstructions.

### 3.0 PROCEDURAL HIGHLIGHTS

Prior to testing, vehicle attitude and R point location data on each vehicle was obtained. This data included design attitude, seat travel, seat back angle, and location of the R point. From this data, the coordinates of the reference axes and planes were computed.

The driver seat was removed to allow for installation of the test equipment. All openings except front windows were closed, the sun visor was stowed, and the steering wheel (if adjustable) was placed in its midrange position.

The vehicle was then positioned for testing. The vehicle centerline was placed directly over the facility pad centerline. The attitude of the vehicle was adjusted (using hydraulic and conventional jacks) to the manufacturer's specifications. The location of the vehicle's left front fiducial mark was projected downward and marked on the concrete pad. A measurement was made from this fiducial mark projection to locate the longitudinal position of the R point.

The reference plate was positioned over a lateral line through the R point. The plate was adjusted laterally so that the R point was the correct distance from the vehicle centerline. Finally, the height of the reference plate was adjusted by projecting the elevation of the plate to the forward reference station and adjusting the plate until the correct height was obtained. After height adjustments were made, the fixture setup was complete. In general, the reference plate was set up to be properly positioned for binocular

measurements. A counter adjustment for changes in the longitudinal position was built into the V2 plate for monocular measurements.

The horizontal circle of the theodolite was set to zero with the sight tube pointed forward parallel to the vehicle centerline. The theodolite's position was adjusted for each series of measurements by attaching the proper mounting plate. The detailed measurement procedure is given in Appendix A.

Measurements were made in the following sequence.

AMC Concord Test No. 1

Ford Van Test No. 1

IHC Tractor Test No. 1

Ford Van Test No. 2

IHC Tractor Test No. 2

AMC Concord Test No. 2

IHC Tractor Test No. 3

AMC Concord Test No. 3

Ford Van Test No. 3

After each test the vehicle was restored to its original condition and driven several miles on the test track.

#### 4.0 SUMMARY OF RESULTS

Results are summarized in the following tables:

- Table 1 - Monocular Obstruction Angles.
- Table 2 - Binocular Obstruction Angles.
- Table 3 - Ambinocular Fields of View.
- Table 4 - Mirror Locations.

Pertinent comments on the individual vehicles follow in subsequent paragraphs. Full details and photographs of each vehicle are presented in Appendices B, C, and D.

TABLE 1. SUMMARY OF MONOCULAR OBSTRUCTION ANGLES

Test	VEHICLE: AMC Concord					
	Zone I		Zone II		Zone IV	
	V1	V2	V1	V2	V1	V2
1	9°34'	8°12'	6°41'	6°14'	24°49'	26°12'
2	9°32'	8°10'	6°50'	6°24'	24°47'	26°15'
3	9°36'	8°08'	6°50'	6°25'	24°51'	26°22'

VEHICLE: Ford Van						
Test	Zone I			Zone II		
	V1	V2	V1	V2	V1	V2
1	10°19'	10°10'	6°29'	6°33'	21°08'	21°32'
2	10°03'	9°53'	6°28'	6°25'	21°14'	21°32'
3	9°57'	9°55'	6°20'	6°16'	21°16'	21°34'

VEHICLE: IHC Tractor						
Test	Zone I			Zone II		
	V1	V2	V1	V2	V1	V2
1	16°01'	15°49'	9°12'	9°15'		
2	16°05'	15°45'	9°11'	9°09'		
3	16°03'	15°49'	9°10'	9°12'		

TABLE 2. SUMMARY OF BINOCULAR OBSTRUCTION ANGLES

VEHICLE: AMC Concord			
Test	Zone I		Zone II
	5°24'		4°07'
	5°40'		4°10'
Test 3	5°25'		4°10'

VEHICLE: Ford Van			
Test	Zone I		Zone II
	3°24'		3°09'
	4°41'		3°17'
Test 3	5°30'		3°17'

VEHICLE: IHC Tractor			
Test	Zone I		Zone II
	8°41'		4°11'
	8°44'		4°36'
Test 3	8°48'		4°30'

TABLE 3. SUMMARY OF AMBINOULAR FIELDS OF VIEW

VEHICLE: AMC Concord						VEHICLE: Ford Van (tested as a car)					
Left Outside Unit Mirror Target SL			Right Outside Unit Mirror Target SR			Left Outside Unit Mirror Target SL			Right Outside Unit Mirror Target SR		
Area (ft <sup>2</sup> )	Net Area (ft <sup>2</sup> )	Per- cent	Area (ft <sup>2</sup> )	Net Area (ft <sup>2</sup> )	Per- cent	Area (ft <sup>2</sup> )	Net Area (ft <sup>2</sup> )	Per- cent	Area (ft <sup>2</sup> )	Net Area (ft <sup>2</sup> )	Per- cent
Test E7	E8		E5	E6		E5	E6		E5	E6	
1 12.7	11.1	18.3	61	19.5	18.5	21.2	71		24.5		82
2 12.5	10.7	17.9	60	21.0	22.2	25.3	84		26.0		87
3 12.2	10.9	17.5	58	17.9	18.5	21.0	70		25.8		86

TABLE 3. SUMMARY OF AMBINOLOCULAR FIELDS OF VIEW (CONT'D)

VEHICLE: IHC Tractor

Test	Left Outside Unit Mirror Target XL			Right Outside Unit Mirror Target XR			Left Outside Convex Mirror Target YL			Right Outside Convex Mirror Target YR		
	Area		Net	Area		Net	Area		Net	Area		Net
	Area (ft <sup>2</sup> )	Net (ft <sup>2</sup> )	Area Per- cent	Area E5 (ft <sup>2</sup> )	Net E6 (ft <sup>2</sup> )	Area Per- cent	Area E7 (ft <sup>2</sup> )	Net E8 (ft <sup>2</sup> )	Area Per- cent	Area E5 (ft <sup>2</sup> )	Net E6 (ft <sup>2</sup> )	Area Per- cent
1	19.6	21.7	27	100	11.0	11.2	16.4	61	600	600	100	480
2	18.7	20.1	27	100	10.7	10.6	16.4	61	600	600	100	480
3	18.9	22.5	27	100	11.2	12.0	16.4	61	600	600	100	480

VEHICLE: Ford Van (tested as a truck)

Test	Left Outside Unit Mirror Target XL			Right Outside Unit Mirror Target XR			Cross View Mirror			Right Outside Convex Mirror Target YR		
	Area		Net	Area		Net	Area		Net	Area		Net
	Area (ft <sup>2</sup> )	Net (ft <sup>2</sup> )	Area Per- cent	Area E5 (ft <sup>2</sup> )	Net E6 (ft <sup>2</sup> )	Area Per- cent	Area E7 (ft <sup>2</sup> )	Net E8 (ft <sup>2</sup> )	Area Per- cent	Area E5 (ft <sup>2</sup> )	Net E6 (ft <sup>2</sup> )	Area Per- cent
1	27.0*	22.2	27	100	15.2	17.2	21.7	80	15.2	15.0	15.2	76
2	27.0*	20.9	27	100	15.1	17.2	21.7	80	15.0	14.2	15.0	75
3	27.0*	21.8	27	100	15.5	17.4	21.7	80	12.7	11.7	12.7	64

\*Complete target board visible through mirror.

TABLE 4. MIRROR LOCATIONS (REPORTED AS LOCATION OF GEOMETRIC CENTER)

Vehicle	Mirror	Angle at Appropriate P Point		Distance Forward of V Point		Distance Below V2 Above V1	
		Measured	Allowable	Maximum	Measured	Minimum Allowable	Geometric Center
AMC	Left Outside	45°	60°	18.7	12	4.52	-
AMC	Interior	35°	60°	17.0	12	-	1.71
AMC	Right Outside	65°	60°	18.3	12	4.45	-
Ford Van	Left Outside	46°	65°	23.0	12	8.55	-
	Interior	37°	75°	25.3	12	-	2.72
	Right Outside	71°	75°	19.7	12	8.14	-
	Right Outside Convex	73°	75°	17.0	12	12.72	-
IHC	Left Outside Unit	68°	65°	9.1	12	0.27	-
	Left Outside Convex	70°	65°	9.3	12	12.84	-
	Right Outside Unit	79°	75°	8.8	12	0.81	-
	Right Outside Convex	80°	75°	9.4	12	13.14	-

\*The proposed rule requires all of the mirror to be either below a level plane 0.75-inch below V2 or above a level plane 0.75-inch above V1. The height of the geometric center is reported here. Half of the mirror height must be subtracted from the dimensions shown to determine pass or fail relative to the proposed rule.

#### 4.1 AMC CONCORD

It should be noted that the left rear fiducial mark of the Concord was never at the proper height because the frame appeared to be distorted upward about a half inch. It was necessary to remove the steering wheel in order to project the bottom line of view area A onto the windshield.

Monocular and binocular results were very consistent. The ambinocular results for the left outside mirror are very consistent. The right outside mirror shows more area in Test 2 than in Tests 1 and 3. This seems to be a problem in mirror adjustment. Because of the distance of the right outside mirror from the eye-point, the image is small and uncertainty in computing the visible area is consequently larger. For the interior rearview mirror, the smallest area was measured in Test 1. In examining the data it appears that even though the interior rearview mirror positioning points were reasonably well aligned, there was a slight clockwise rotation in the mirror in Tests 2 and 3 which allowed the mirror to view slightly more area than in Test 1 where it was more level. It should also be noted that the mirrors were positioned according to a standard procedure in order to acquire data on the repeatability of this procedure. Thus, the mirrors may not necessarily be in a position to maximize the view of the target.

Table 4 shows mirror locations. The right outside mirror does not fall within the required 60° envelope. All other mirrors appear to meet the location requirements.

#### 4.2 FORD VAN

This vehicle was difficult to position accurately. The rear fiducial mark was difficult to see clearly. Consequently, there is uncertainty in the height-above-the-pad measurement.

Overall, the monocular and Zone II binocular results were consistent. There was considerable variation from test to test in the Zone I binocular measurements shown in Table 2. This measurement was repeated in Test 2 and produced results of  $4^{\circ}41'$  and  $4^{\circ}29'$ . No valid explanation for the test-to-test difference has been found, but it appears to be associated with the configuration of the wing window and possibly the orientation the seal takes when the window is opened and closed between tests. The ambinocular results for the left and right outside unit mirrors are reasonably consistent. The right outside convex mirror viewing Target YR was mounted partially below the right windowsill which obscured a significant portion of the mirror (see photos in Appendix C). For the cross-view mirror a low value was obtained on Test 3 again attributable to difficulty in positioning the mirror. Also, since this mirror is a convex mirror the image size is reduced and it is difficult to accurately determine the visible area.

Table 4 shows that all mirror locations except the right outside mirrors meet the requirements of the proposed rule. Although the geometric centers of the right outside mirrors fall within the  $75^{\circ}$  envelope, not all portions of the mirrors fall within that envelope.

#### 4.3 IHC TRACTOR

This vehicle was the only vehicle in which the crossbar was never used (see Section 2.0, Facility Description). Using the seat pedestal seems to provide closer control of the instrument setup.

In all tests, monocular, binocular, and ambinocular, results were consistent and showed little variability.

Table 4 shows that none of the mirrors on this vehicle meet the location requirements of the proposed rule.

#### 4.4 SUMMARY

A review of the pictorial information in Appendix E indicates that the vehicle and viewing apparatus were set up repeatably from test to test. There was some problem in aligning the mirrors per the procedure in Appendix A (Paragraph G, H, and I) in that the mirror mount would not hold the exact position the operator attempted to place it in. That is, friction in the adjustment mechanism prohibited a precise placement of the mirror. The procedure followed in aligning the mirrors does not ensure that view of the target will be maximized. This is a difficult operation to specify in a standard procedure, and it appears that positioning of the mirror may best be left to the judgement of the operator.

All the direct field of view measurements show fairly close reproducibility except the Zone 1 binocular measurements on the Ford Van which were discussed earlier.

For the rear view mirror systems, areas measured in the three tests on the left outside unit mirror lie within  $\pm 2$  percent of the mean for each vehicle.

Areas measured on the interior rearview mirrors show a variation of up to 4.3 percent from the mean value. The right outside unit mirrors on passenger cars show a similar variation.

Measurements on the truck mirrors are very consistent. A particular reason for this consistency on the left outside mirrors is that the entire left side target could be seen. Thus, there is no inherent error introduced in determining the visible area. That is, if only part of the target can be seen, some measurement technique (polar planimeter, counting squares, or etc.) must be used to compute the visible area. Any such measurement method has inherent error. Thus, when the entire target is visible, the area need not be computed but can be recorded as the total known area of the target.



**APPENDIX A**  
**TEST PROCEDURES**

## A.0 VEHICLE SETUP

1. Fill out Data Sheet 1.
2. Wash vehicle if necessary.
3. Locate points on front and rear bumpers which lie on vehicle longitudinal centerline using symmetrical properties of vehicle body design (frame rails, bumper mounts, etc.).
4. Attach plumb bobs at points marked on front and rear bumpers in Step 3.
5. Set up the theodolite west of the pad and on the pad centerline. Rotate the barrel so that it is looking in a vertical plane through the pad centerline.
6. Without disturbing the theodolite, align the vehicle on the pad such that:
  - a. The approximate seating reference point (SRP) is over the level plate lateral reference line.
  - b. The centerline of the vehicle (indicated by marks on the bumper) is directly over the level plate longitudinal reference line.
7. After the vehicle is in position, sight through the theodolite as previously set up, and permanently mark the intersection of the line of sight with the windshield and cab roof. This establishes a reference plane which will be used in later measurements. The theodolite setup can now be removed.
8. Remove the front seats from the vehicle.
9. Adjust the elevation of the vehicle to position the vehicle at the specified height above the ground zero reference plane on the pad. Securely block vehicle up in this position (four places). (Use frame height figures in Tables A-1, A-2 or Figure A-1 for IHC Tractor.)
10. Measure back from the fiducial marks to locate the longitudinal station of the SRP (both sides) shown in Column 2 Table A-3 or Figure A-1 (for IHC).
11. Correct the measurement in Step 10 using the value shown in Column 3 (none shown for IHC Tractor), Table A-3 (both sides). Mark these points on the level plate.
12. Lay out a lateral line in the horizontal plate through the points determined in Step 11.
13. By means of the crossbar or pedestal support, position the reference plate in the vehicle so that the forward

TABLE A-1. LOCATION OF FIDUCIAL MARKS - AMC CONCORD

Front Fiducial Mark*			Rear Fiducial Mark*		
Approximate Distance to Front Wheel Centerline	Distance From Body Reference Planes	1 Pass Height Above Ground	Approximate Distance to Front Wheel Centerline	Distance From Body Reference Planes	1 Pass Height Above Ground
X	Y	Z	X	Y	Z
9.68	26.38	0.80	8.923	62.26	26.22

\*Located at the forward upper corner of the 1.51-inch notch on the down-flange of the rocker panel.

TABLE A-2. 1978 MASTER CONTROL SECTION REFERENCE POINTS(1) FORD ECONOLINE

BEPEO Master Control Section Drawing Number	Attachment	Cross Section at This Inch Line		Height Above Ground (At Curb Load)
		X(2) (in.)	Y(3) (in.)	
D5UB-1110514-24	B	29.00	±35.62	+2.40
D5UB-1110514-25	C	32.00	±32.80	-1.71
D5UB-1110514-26	D	98.00	36.06	+2.40
	Rear of Sliding Side Cargo Door			18.75 (to Top of Sill)

(1)Coordinates given with respect to the body grid reference system which is a right-handed, Cartesian reference system, with the +z axis point in an upward direction.

(2)Measured longitudinally from the zero X plane.

(3)Measured laterally from the zero Y plane.

(4)Measured vertically from the zero Z plane.

Four permanent marks as described below (Figure A-1) must each be 49.0" above a horizontal surface. Permanent marks: remove threshold on both right and left sides. Two targets each side will then be visible. Both are on a horizontal surface parallel to the ground and on a longitudinal line parallel with the vehicle centerline. Targets (permanent marks) are shown in the sketch below. By means of jacks, adjust the vehicle to the specified height.

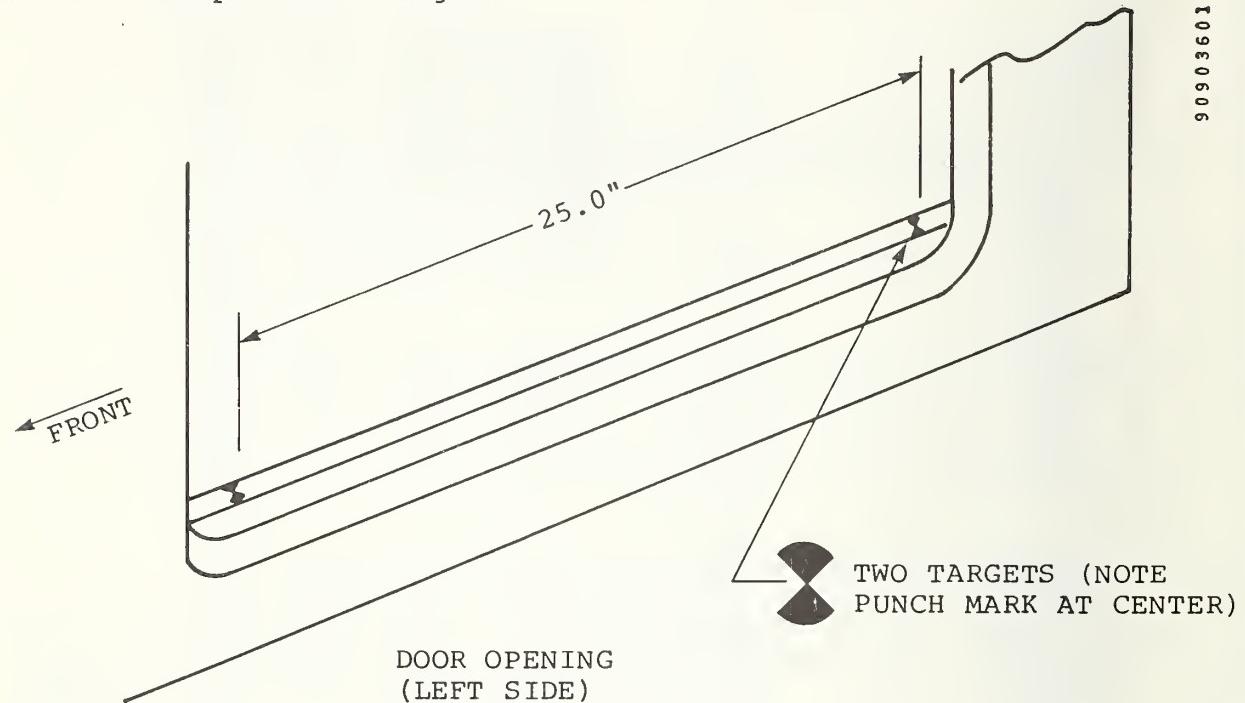


Figure A-1A.

FRONT VIEW

SIDE VIEW

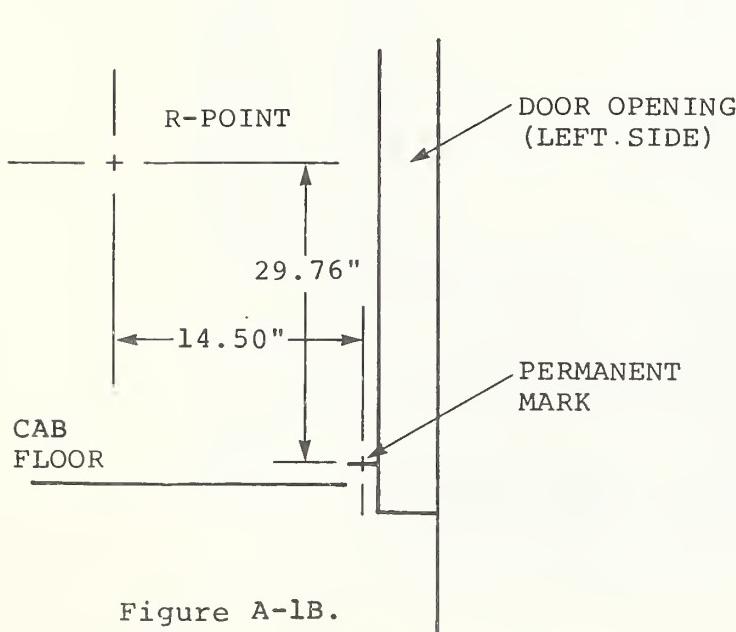


Figure A-1B.

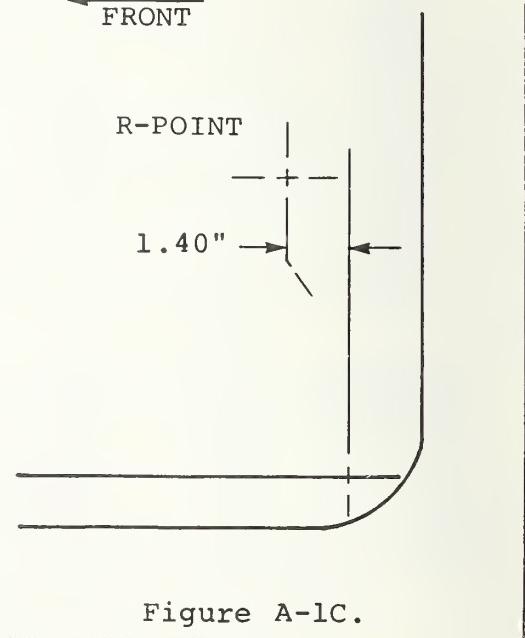


Figure A-1C.

Figure A-1. IHC Tractor Design Attitude.  
A-4

TABLE A-3. DIMENSIONAL DATA FOR DIRECT FIELDS OF VIEW (AMC CONCORD AND FORD ECONOLINE)

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7	Column 8	Column 9
Distance From Zero X Plane to Master Fiducial Vehicle	L31 Distance From Zero X Plane to Y-Z Plane (R Point)		Lateral Distance From Zero Y Plane to the R Point	$\Delta$ Counter- Correction for V Point	Height of V2 from Zero Ground	Lateral Distance of V2 from Zero Y Plane	Height of V1 Above Ground	Longitudinal Distance of V1/V2 From Y-Z Plane
AMC Concord	9.68	44.36**	-1.22	-12.50***	+0.88	42.33	-12.70	45.33
Ford Econoline	32.00 (to rear of notch)	46.50	-2.27	-19.75	+0.88	63.39	-19.95	66.39

A-

Note:  $\Delta+$  means move rearward,  $\Delta-$  means move forward.  
 $*+$  means add to L31,  $-$  means subtract from L31.  
\*\* Longitudinal distance of the R-point rearward of the front fiducial mark is 34.68 inches.  
\*\*\* Individual front seats.

TABLE A-4. DIMENSIONAL DATA FOR DIRECT FIELD OF VIEW (IHC TRACTOR)

<u>Column 1</u>	<u>Column 2</u>	<u>Column 3</u>	<u>Column 4</u>	<u>Column 5</u>	<u>Column 6</u>	<u>Column 7</u>	<u>Column 8</u>	<u>Column 9</u>
Plate Reference Point to:						Lateral Distance		
Back to	Down to	Leftward				of V2	Height	Longitudinal
Rear	Permanent	to Perm.				From Perm.	of V1	Distance of
Target	Mark	Mark				Above Mark	Above	V1/V2 From
Vehicle	Figure 3	Figure 2	Figure 2			Ground	Fig. A-1P	Y-Z Plane
IHC	Tractor	9.62	29.76	14.50	+0.88	91.74	-14.30	94.74
Note:	+ means move rearward.							14.30

edge of the reference plate lies in the vertical plane established in Step 11. (If the horizontal crossbar is used, adjust the bases of the crossbar support so that the legs are in a vertical plane.)

14. Establish the longitudinal centerline of the vehicle interior, using the centerline marked on the windshield in Step 7, and the centerline of the rear window or rear obstruction.
15. Measure laterally from the vehicle cab centerline the distance specified in the appropriate table to establish the R point lateral location. Position the reference plate longitudinal centerline at the specified distance from the vehicle centerline.
16. Recheck the specified lateral and longitudinal position (Steps 13 and 15) of the reference plate, and readjust as required to obtain the specified readings in each direction.
17. Place sandbags on the base of each crossbar support to ensure it is held in a stable position. (If the pedestal support is used, it must be securely clamped with a C-clamp at each corner.)
18. Install V2 plate on the crossbar and position the plate longitudinally using the correction value in Column 5 of Table A-3 or A-4.
19. Mount the theodolite on the V2 plate. Level the theodolite and adjust the vertical angle to 90°.
20. View the vertical scale on the reference station in front of the vehicle and adjust height of reference plate to the value shown in Column 6 of Tables A-3 or A-4. Verify that the plate support is still horizontal after this adjustment and that it is still over the line determined in Step 11.
21. View the horizontal scale on the front reference station and set theodolite to zero horizontal degree reading at distance from centerline specified in Column 7 of Table A-3 or A-4.
22. Rotate the telescope to the 3 o'clock position (90° horizontally), and verify that reading specified in Column 9, Tables A-3 or A-4 is obtained.
23. Wash and clean all windows and mirrors.

NOTE: After completion of Step 23, the vehicle and fixture are ready for measurements.

## B.0 TEST CONDITIONS

### B.1 FOR DIRECT FIELDS OF VIEW

The vehicle shall be tested using the following test conditions:

1. Vehicle attitude shall be stabilized on a horizontal surface with four jacks to prevent movement when being tested. The attitude shall be as specified by the manufacturer.
2. All vehicle openings are closed, such as windows and hatchback tailgates, except the two front windows which may be opened, if necessary, to accommodate measurement equipment.
3. The rearview mirrors are adjusted as described in Section G (Passenger Cars), H (Vans), or I (Trucks).
4. The sunvisor is adjusted in its stowed position.
5. The steering wheel is positioned so that the front wheels are approximately straight ahead. An adjustable steering wheel is positioned in its middriving position.
6. Seats and/or head restraints may be removed if necessary to accommodate the measurement equipment. Seats, seat belts, and head restraints shall not be included as obstructions in the measurements.

### B.2 FOR INDIRECT FIELDS OF VIEW

The vehicle shall be tested using the following test conditions:

1. Vehicle attitude shall be stabilized on a horizontal surface with four jacks to prevent movement when being tested. The attitude shall be as specified by the manufacturer.
2. All vehicle openings are closed, such as windows and hatchback tailgates, except the two front windows which may be opened, if necessary, to accommodate measurement equipment.

3. The rearview mirrors are adjusted as described in Section G, H, or I.
4. The sunvisor is adjusted in its stowed position.
5. The steering wheel is positioned so that the front wheels are approximately straight ahead. An adjustable steering wheel is positioned in its mid-driving position.
6. Adjustable head restraints are placed in fully extended position.
7. Each adjustable seat is in the rearmost position and lowest vertical position.

#### C. MONOCULAR MEASUREMENTS

1. Move the plumb bob along the lateral scale in front of the vehicle so that it is at the distance determined in Step 21. With the vertical crosshair on the plumb bob, set the horizontal angle to zero. Mark this point on the windshield and label point V2.
2. Rotate the instrument to the nine o'clock position and sweep clockwise until an obstruction to the line of sight is encountered. Record in the data table the angle to the point at which the obstruction is encountered.
3. Sweep to the opposite side of that obstruction and also record the angle and distance in this position.
4. Continue sweeping clockwise until the next obstruction is encountered, and repeat the measurements described above. Continue in this fashion until the telescope is in the six o'clock or 180-degree position, recording all obstruction angles and distances.
5. With the theodolite adjusted to a horizontal angle of zero (straight ahead), rotate the telescope downward through the angle specified in Column 4 of Table A-5. Mark this point on the windshield for future reference.
6. Remove the theodolite from the V2 plate and install the extended V1 plate onto the V2 plate by means of the proper spacers.
7. Reinstall the theodolite in the extreme left mounting hole in the V1 plate. Level the instrument and verify that the sight tube is level regardless of the angle in which it is pointed.
8. Set the vertical angle of the theodolite to 90°. Read the height of the instrument on the vertical scale in the front of the automobile and verify that it is the same as specified in Column 8, Table A-3 or A-4.

TABLE A-5. ANGULAR DIMENSIONS FOR HORIZONTAL LINES IN THE VIEW AREA

Vehicle	Reference Point Height (in.)	Column 1	Column 2	Column 3	Column 4	Column 5
		(For Reference Only) Angle Relative to X-Y Plane				To Shade Band Up
		For Side b	For Side d	For Side f	Down*	
Concord	19.05	9.0		12.0	3.0	7.0
Ford Econoline	39.84	8.0		10.0	4.5	6.0
IHC Tractor	67.47	6.5		8.0	7.5	5.5

\*Measured from V2. All other angles are from V1.

9. With the vertical crosshair on the plumb bob, adjust the horizontal angle to zero. Mark the V1 point on the windshield.
10. Rotate the instrument to the nine o'clock position and sweep clockwise until an obstruction to the line of sight is encountered. Record the angle to the point at which the obstruction is encountered.
11. Sweep the opposite side of that obstruction and also record the angle and distance in this position.
12. Continue sweeping clockwise until the next obstruction is encountered, and repeat the measurements described above. Continue in this fashion until the telescope is in the six o'clock position, recording all obstruction angles and distances as the telescope sweeps through the required angles.

#### D.0 VIEWING AREA A LOCATION

NOTE: These measurements will be made with the telescope set up in the V1 position as in the previous measurements. The object is to establish the position of the shade band and to layout the six-sided figure shown in Figure A-2.

1. With the telescope looking straight ahead, mark the intersection of the line of sight with the windshield. Rotate the barrel upward until the bottom edge of the shade band is encountered. Record the vertical angle.

2. Rotate the barrel in this same vertical plane until the vertical angle reads the value shown in Column 5 of Table A-5. Mark this position on the windshield.
3. Rotate the telescope to a horizontal angle  $17^\circ$  counter-clockwise from the zero position ( $343^\circ$ ). Mark points on the windshield at three different vertical angles so that the points extend from the top to the bottom of the windshield (Side a, Figure A-2).
4. Rotate the telescope to a horizontal angle  $13^\circ$  counter-clockwise from the zero position ( $347^\circ$ ). Mark points on the windshield at three different vertical angles so that the points are in the top half of the windshield (Side c, Figure A-2).
5. Rotate the telescope to a horizontal angle of  $22^\circ$  clockwise from the zero position ( $22^\circ$ ). Mark points on the windshield at three different vertical angles so the points extend from the top to the bottom of the windshield (Side e, Figure A-2).
6. Rotate the telescope upward in the vertical plane to the angle listed for this vehicle in Column 2, Table A-5. Have a helper place a point on the windshield, aligned with the horizontal crosshair in the telescope (Side b, Figure A-2).
7. Rotate the telescope upward from this position to the angle specified in Column 3, Table A-5, for this automobile, and again have a helper place a point on the windshield at the horizontal crosshair position (Side d, Figure A-2).
8. Move the theodolite to the hole in the extended V1 plate 3 inches to the right of the first hole.
9. Move the plumb bob at the front reference station 3 inches to the right.
10. Level the theodolite and zero the horizontal angle on the plumb bob. Mark the line of sight on the windshield.
11. Repeat Steps 6 and 7.
12. Move the theodolite to the hole in the extended V1 plate 9 inches to the right of the first hole.
13. Move the plumb bob at the front reference station 9 inches to the right.
14. Level the theodolite and zero the horizontal angle on the plumb bob. Mark the line of sight on the windshield.
15. Repeat Steps 6 and 7. Connect the points marked in Steps 1, 10, and 14. This is the intersection of a level plane through V1 and the windshield. Also connect the points marked in Steps 6, 7, 11, and 15 to get Sides b and d of View Area A.

16. Remove the theodolite from the V1 plate.
17. Remove the extended V1 plate and spacers. Mount the V1 plate directly on the V2 plate.
18. Install the theodolite in the 9-inch hole on the extended V1 plate.
19. Level the theodolite and zero the horizontal angle on the plumb bob.
20. Rotate the telescope downward from the level position to the angle specified in Column 4 of Table A-5. Again mark a point on the windshield which coincides with the horizontal crosshair on the telescope.
21. Move the theodolite to the 6-inch hole on the extended V1 plate.
22. Move the plumb bob at the front reference station to the 6-inch position.
23. Level the theodolite and zero the horizontal angle on the plumb bob.
24. Rotate the telescope downward from the level position to the angle specified in Column 4 of Table A-5. Mark this point on the windshield.
25. Move the theodolite to the extreme left hole on the extended V1 plate.
26. Move the plumb bob to the zero position at the front reference station. The location on the lateral scale should be the value in Column 7 of Table A-3 or A-4.
27. Level the theodolite and zero the horizontal angle on the plumb bob.
28. Rotate the telescope downward from the level position to the angle specified in Column 4 of Table A-5. Mark this point on the windshield.
29. Measure the distance between the points located in Step 28 and Step 5 of Section C, Monocular Measurements.
30. Offset the points located in Steps 20 and 24 by the distance measured in Step 29. Connect these points. This is Side f of Figure A-2.
31. Remove the theodolite.
32. Estimate whether front edge of hood is visible through the viewing area from the V2 position.
33. Transfer the viewing area, lower boundary of shade band, sunvisor obstruction area, V1 and V2 points and all other reference points marked on the windshield to vellum cut to the shape of the windshield.

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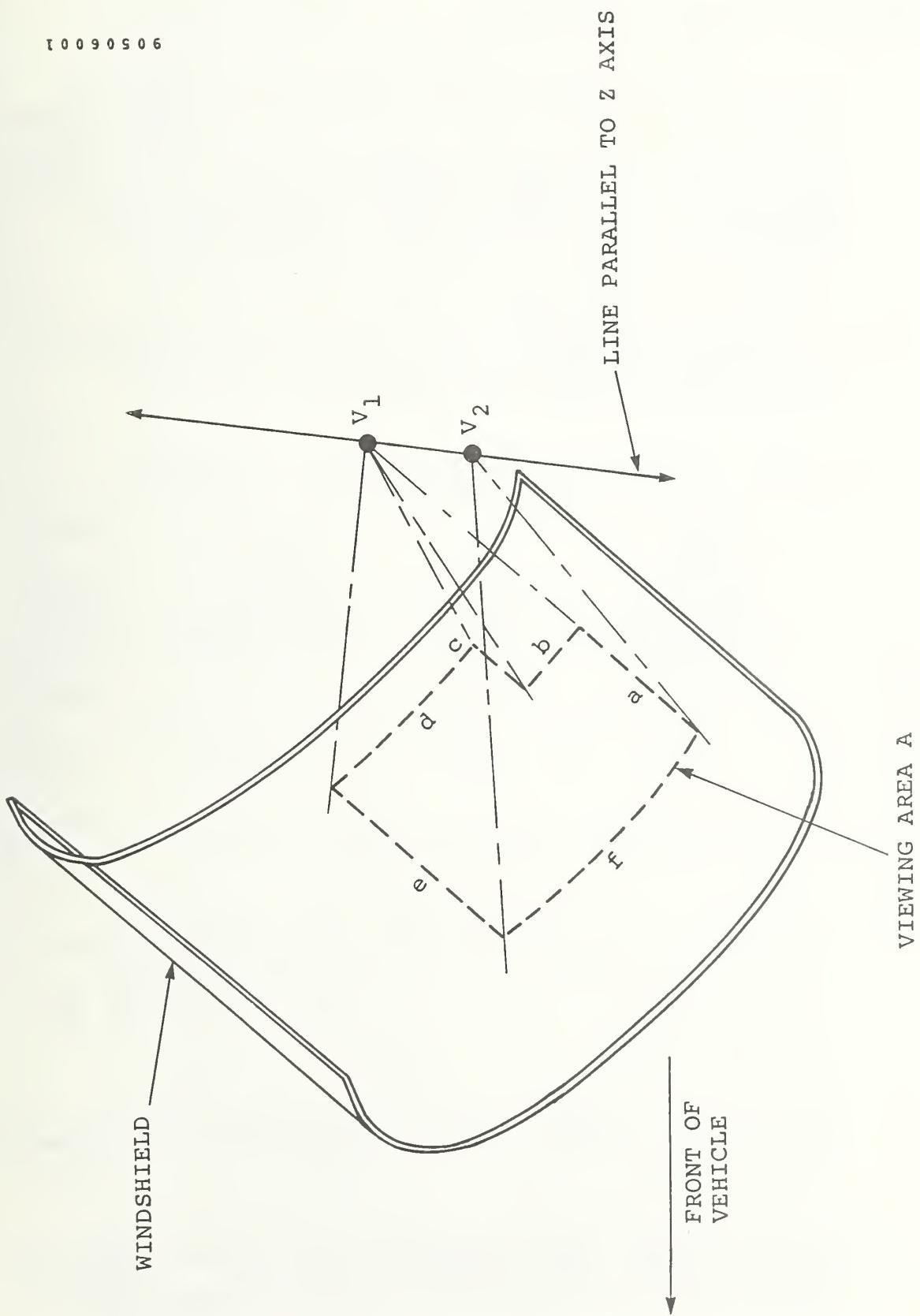


Figure A-2. Viewing Areas on Windshield.

## E.0 BINOCULAR OBSTRUCTION ANGLES

1. Remove the V2 plate from the horizontal crossbar and attach the P plate. After attaching the P plate, insert the shaft of the E plate in the P1 hole of the P plate. Insert the referencing pin in the bottom of the P plate and through the E plate (this aligns the axis of the E plate parallel to that of the P plate and thus also parallel to the Zero Y plane). Clamp the two plates together at this time to aid in further setup.
2. Install the theodolite in the E1 hole.
3. Set up the plumb bob at the front of the car so that it is the distance from the vehicle centerline (Zero Y plane) shown in Column 1, Table A-6.

TABLE A-6. BINOCULAR MEASUREMENT SETUP DIMENSIONS

Vehicle	Column 1	Column 2	Column 3	Column 4
	E1 Lateral Distance From Vehicle Centerline	Height Above Ground (in.)	E4 Lateral Distance From Vehicle Centerline	Height Above Ground (in.)
Concord	14.57	43.81	9.38	43.81
Ford Econoline	21.82	64.87	16.63	64.87
IHC Tractor	17.83	93.22	12.64	93.22

4. Level the theodolite and adjust the horizontal angle reading so the plumb bob is at the zero position.
5. Verify that the instrument is at the height shown in Column 2 of Table A-6.
6. Reserved.
7. Rotate the telescope to the nine o'clock position ( $270^\circ$ ), then sweep clockwise until an obstruction to the line of sight is encountered. Read the angle on the horizontal circle and record angle.
8. If the angle in Step 7 is less than  $330^\circ$ , set the telescope to a horizontal angle reading of  $330^\circ$ . Remove the clamp holding the E and P plates together. Rotate the E plate until the obstruction is again in view. Replace

the clamp holding the plate together. If the angle observed earlier was greater than  $330^\circ$ , do not disturb the original relationship between the E and P plates, but begin the obstruction measurements at that point.

9. Reserved.
10. With the E and P plates remaining clamped, swing the telescope to  $90^\circ$  and establish a benchmark on some distant object to aid in repositioning the theodolite to E2. The distant point will lie on an extension of the line passing through points E1 and E2.
11. Remove the theodolite from the E1 hole and place it in the E2 hole. Set the horizontal angle reading to  $90^\circ$  and flip the clutch lever to hold this reading. Level the instrument and aim the telescope at the benchmark established in Step 10. Release the clutch.
12. Now swing the telescope clockwise until the line of sight is on the opposite side of the obstruction. Record the horizontal angle.
13. Repeat Steps 7 through 12 for all other obstructions in the Zone I region.
14. For Zone II measurements, remove the E plate from the P1 hole and insert the shaft in the P2 hole. The theodolite will now be set up in the E4 mounting hole (previously called E2).
15. Move the plumb bob to the distance from the centerline shown in Column 3 of Table A-6. Align the E plate in the straightforward position using the referencing pin as in Step 1.
16. Level the theodolite and adjust the horizontal angle reading so the plumb bob is at the zero degree position.
17. Rotate the telescope to the three o'clock position and then move it back counterclockwise until an obstruction is encountered. Read the angle on the horizontal circle and record it.
18. Reserved.
19. If the angle in Step 17 is  $30^\circ$  or less, continue with Step 20. If the angle is greater than  $30^\circ$ , set the theodolite to a horizontal angle reading of  $30^\circ$ . Remove the clamp holding the E and P plates together and rotate the E plate until the obstruction is again in view. Replace the clamp.
20. With the E and P plates clamped together, swing the telescope counterclockwise to a horizontal angle of  $270^\circ$ . Establish a benchmark on a distant point to aid in repositioning the theodolite to E3. The distant point will lie on an extension of the line connecting points E3 and E4.

21. Move the theodolite to the E3 hole. Set the horizontal angle reading to 270° and flip the clutch level to hold this reading. Level the theodolite and aim the telescope at the benchmark established in Step 20. Release the clutch.
22. Swing the telescope counterclockwise until the opposite side of the obstruction is in view. Record the horizontal angle.
23. Repeat Steps 17 through 22 for all other obstructions in Zone II.

#### F.0 POSITIONING REPEATABILITY REFERENCE SYSTEM

##### F.1 FORWARD SIGHTING

After View Area A has been lined out on the windshield, proceed to the following:

1. Mount a white, 4' x 8' sheet of plywood on the reference poles in front of the vehicle. Position the board such that when viewed through View Area A from V1, the bottom edge of the board is about 6 inches below the projection of the bottom edge (Side f) of the view area.
2. Place 3 circular targets (approximately 1/2 inch in diameter) on the inside surface of the windshield within View Area A as follows: (1) near the lower left corner, (2) near the lower right corner, (3) near the midpoint of the upper boundary (Side d).
3. Place 3 square targets (approximately 2 inches on a side) on the white board in front of the vehicle as follows when viewed from V1 with reference to an imagined projection of View Area A on the white board: (1) place one at the lower midpoint (Side f) of the projection, (2) place one near the upper right corner, (3) place one near the upper left hand corner.

Set up the camera at V1. Make sure it is level and pointing straight ahead. Photograph the targets set up in the previous steps.

## F.2 REARWARD SIGHTING (CAR AND VAN ONLY)

1. Place 3 circular targets (approximately 1/2 inch in diameter) on the inside surface of the rear window as follows: (1) upper right, (2) upper left, (3) lower middle.
2. Place 3 square targets (approximately 2 inches on a side) on Target Q behind the cars such that they can be viewed from V1. Place targets as follows: (1) lower right, (2) lower left, (3) upper middle of projection of the rear window on the Target Q.
3. Set up the camera in a convenient location approximating the V1 position and looking rearward parallel to the vehicle centerline and in a horizontal plane.

Photograph the targets set up in Steps 1 and 2.

## G.0 POSITIONING PROCEDURE FOR MIRRORS (PASSENGER CAR)

NOTE: Must be done prior to Ambinocular Tests.

### G.1 INSIDE REARVIEW MIRROR

1. (Assumes double pivot support.) Pull support post into a horizontal and longitudinally rearward position. Mark a point on the top of the mirror 1.27 inches left of the geometric center of the image surface.
2. With the theodolite set up at E5, rotate the E plate 30° clockwise. Clamp the E plate to the P plate.
3. Rotate the theodolite sight tube (vertically and horizontally as necessary) and adjust the mirror while keeping the post horizontal and rearward (that is, adjust mirror at the mirror-end pivot only) so that the line of sight passes through the point marked in Item 1, and intersects the top center of Target Q.

### G.2 OUTSIDE RIGHT-HAND MIRROR

1. Mark a point on top of Target SR which is located to the right of the vehicle right side according to the following formula:

$$\frac{1}{2} \frac{(Q - W + .75SR)}{2}$$

where      Q = width of Target Q (12)

W = width of vehicle

SR = width of Target SR (12)

simplified as follows:

$$\frac{30 - W}{4}$$

2. Mark a point on the top of the right outside mirror which is 1.27 inches to the left of the geometric center of the mirror (i.e., image surface).
3. With the theodolite at E5, rotate the E plate 70° clockwise. Clamp the E plate to the P plate.
4. Rotate the theodolite sight tube as necessary while adjusting the mirror until a sight line passes from the theodolite through the point marked on the mirror to the point marked on Target SR.

### G.3 OUTSIDE LEFT-HAND MIRROR

1. Mark a point on the top of Target SL which is located to the left of the vehicle left side the distance:

$$\frac{30 - W}{4}$$

2. Mark a point on the top of the left outside mirror which is 1.27 inches to the right of the geometric center of the mirror.
3. With the theodolite at E8, rotate the E plate 45° in a counterclockwise direction. Clamp the E plate to the P plate.
4. Rotate the theodolite sight tube as necessary while adjusting the mirror until a sight line passes through the point marked on the mirror to the point marked on Target SL.

The mirrors are now ready for the ambinocular measurements.

## H.0 POSITIONING PROCEDURE FOR MIRRORS (FOR VANS)

NOTE: Must be done prior to Ambinocular Tests.

### H.1 INSIDE REARVIEW MIRROR

1. Mark a point at the center of Target Q which is 18 inches above the bottom edge.
2. (Assumes double pivot support.) Pull support post into a horizontal and longitudinally rearward position. Mark a point at the center of the mirror 1.27 inches left of the geometric center point of the image surface.
3. With the theodolite set up at E5, rotate the E plate 30° clockwise. Clamp the E plate to the P plate.
4. Rotate the theodolite sight tube (vertically and horizontally as necessary) and adjust the mirror while keeping the post horizontal and rearward (that is, adjust mirror at the mirror-end pivot only) so that the line of sight passes through the point marked in Item 2, and intersects the point 18 inches above the bottom center line of Target Q (Marked in Item 1). NOTE: REAR DOORS MUST BE OPEN TO DO THIS.

### H.2 OUTSIDE RIGHT-HAND UNIT MIRROR

1. Mark a point 18 inches above the bottom of Target SR which is located to the right of the vehicle right side according to the following formula:

$$\frac{1}{2} \frac{(Q - W + .75SR)}{2}$$

where      Q = width of Target Q (12)

              W = width of vehicle

              SR = width of Target SR (12)

simplified as follows:

$$\frac{30 - W}{4}$$

2. Mark a point on the right outside unit mirror which is 1.27 inches to the left of the geometric center of the mirror (i.e., image surface).
3. With the theodolite at E5, rotate the E plate 70° clockwise. Clamp the E plate to the P plate.
4. Rotate the theodolite sight tube as necessary while adjusting the mirror until a sight line passes from the theodolite through the point marked on the mirror to the point marked on Target SR.

#### H.3 OUTSIDE RIGHT-HAND CONVEX MIRROR

1. Mark a point on the horizontal Target YR as shown in Figure A-3.
2. Mark a point at the geometric center of the convex mirror.
3. With the theodolite at E5, rotate the E plate 70° clockwise. Clamp the E plate to the P plate.
4. Rotate the theodolite sight tube as necessary while adjusting the mirror until a sight line passes from the theodolite through the point marked on the mirror to the point marked on Target YR.

#### H.4 OUTSIDE LEFT-HAND UNIT MIRROR

1. Mark a point 18 inches up from bottom of Target SL which is located to the left of the vehicle left side the distance:

$$\frac{30 - W}{4}$$

2. Mark a point on the left outside mirror which is 1.27 inches to the right of the geometric center of the mirror.
3. With the theodolite at E8, rotate the E plate 45° in a counterclockwise direction. Clamp the E plate to the P plate.
4. Rotate the theodolite sight tube as necessary while adjusting the mirror until a sight line passes through the point marked on the mirror to the point marked on Target SL.

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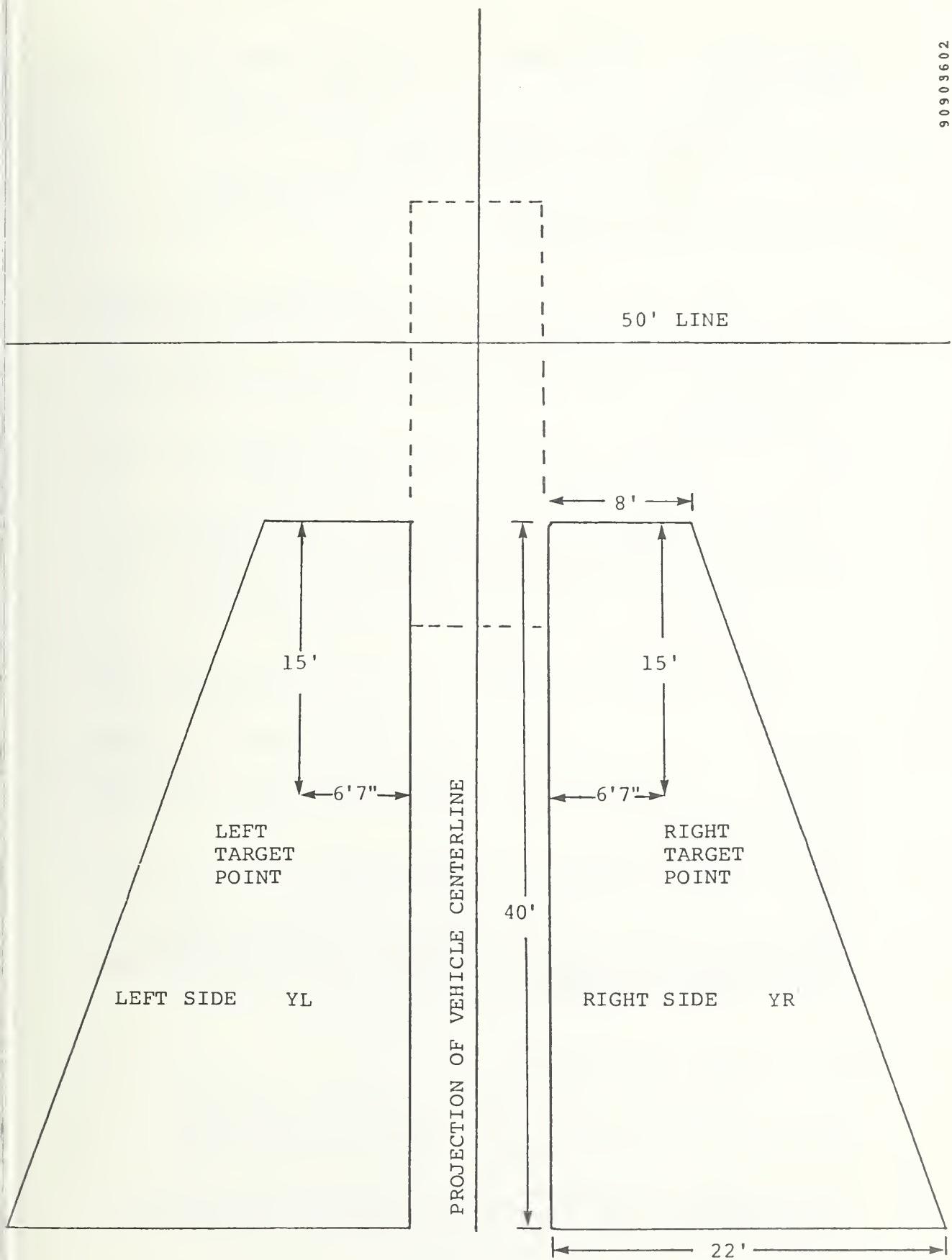


Figure A-3.

The mirrors are now ready for the ambinocular measurements.

## I.0 POSITIONING PROCEDURE FOR MIRRORS (TRUCKS)

### I.1 OUTSIDE RIGHT-HAND UNIT MIRROR

1. Mark a point on the geometric center of Target XR which is located to the right of the vehicle right side.
2. Mark a point on the right outside unit mirror which is 1.27 inches to the left of the geometric center (i.e., image surface).
3. With the theodolite at E5, rotate the E plate 70° clockwise. Clamp the E plate to the P plate.
4. Rotate the theodolite sight tube as necessary, while adjusting the mirror until a sight line passes from the theodolite through the point marked on the mirror to the point marked on Target XR.

### I.2 OUTSIDE RIGHT-HAND CONVEX MIRROR

1. Mark a point on horizontal Target YR as shown in Figure A-3.
2. Mark a point on the right outside convex mirror at the geometric center.
3. With the theodolite at E5, rotate the E plate 70° clockwise. Clamp the E plate to the P plate.
4. Rotate the theodolite sight tube as necessary while adjusting the mirror until a sight line passes from the theodolite through the point marked on the mirror to the point marked on Target YR.

### I.3 OUTSIDE LEFT-HAND UNIT MIRROR

1. Mark a point on the geometric center of Target XL.
2. Mark a point on the left outside unit mirror which is 1.27 inches to the right of the geometric center (i.e., image surface).

3. With the theodolite at E8, rotate the E plate  $45^\circ$  in a counterclockwise direction. Clamp the E plate to the P plate.
4. Rotate the theodolite sight tube as necessary while adjusting the mirror until a sight line passes through the point marked on the mirror to the point marked on Target XL.

#### I.4 OUTSIDE LEFT-HAND CONVEX MIRROR

1. Mark a point on Target YL as shown in Figure A-3.
2. Mark a point of the left outside convex mirror at the geometric center.
3. With the theodolite at E8, rotate the E plate  $45^\circ$  in a counterclockwise direction. Clamp the E plate to the P plate.
4. Rotate the theodolite sight tube as necessary while adjusting the mirror until a sight line passes through the point marked on the mirror to the point marked on Target YL.

The mirrors are now ready for the ambinocular measurements.

#### J.0 PROCEDURE FOR POSITIONING CROSSVIEW MIRROR

1. Mark geometric center of crossview mirror.
2. Position board per requirements of 5.1.2.3.1, page 51662.
3. Place theodolite at E8 and mark positioning point on the board 24 inches forward of the front bumper and 42 inches right of left edge of target board.
4. Rotate E plate counterclockwise  $45^\circ$ .
5. Rotate the theodolite sight tube as necessary while adjusting the mirror until a sight line passes through the geometric center of the mirror to the point marked on the target board.

## K.0 AMBINOCULAR FIELD OF VIEW (ZONE I)

NOTE: Refer to Figure A-4.

1. Install the P plate. (Note: The P plate to be used for indirect fields of view has holes P3 and P4 stamped on it.) After attaching the P plate, insert the shaft of the E plate in the P4 hole of the P plate. Insert the referencing pin in the bottom of the P plate and through the E plate (this aligns the axis of the E plate parallel to that of the P plate and thus also parallel to the Zero Y plane). Clamp the two plates together at this time to aid in further setup.
2. Install the theodolite in the E8 hole (see Figure A-4).
3. Set up the plumb bob at the front of the car so that it is the distance from the vehicle centerline (zero Y plane) shown in Column 1, Table A-7.

TABLE A-7. AMBINOCULAR MEASUREMENT SETUP DIMENSIONS

Vehicle	Column 1 E8 (Use With P4) Lateral Distance From Vehicle Centerline	Column 2 Height Above Ground (in.)	Column 3 E5 (Use with P3) Lateral Distance From Vehicle Centerline	Column 4 Height Above Ground (in.)
Concord	10.03	44.15	15.37	44.15
Econoline	17.28	65.21	22.62	65.21
IHC Tractor	13.29	93.56	18.63	93.56

4. Level the theodolite and adjust the horizontal angle reading so the plumb bob is at the zero position.
5. Verify that the instrument is at the height shown in Column 2 of Table B-4.
6. Read vertical and horizontal angle and distance to geometric center of mirror. Record on mirror position page.
7. Rotate the telescope to the nine o'clock position ( $270^\circ$ ) then sweep clockwise until the vertical midpoint on the left side of the image area is encountered. Read the angle on the horizontal circle and record angle.

## PROPOSED RULES

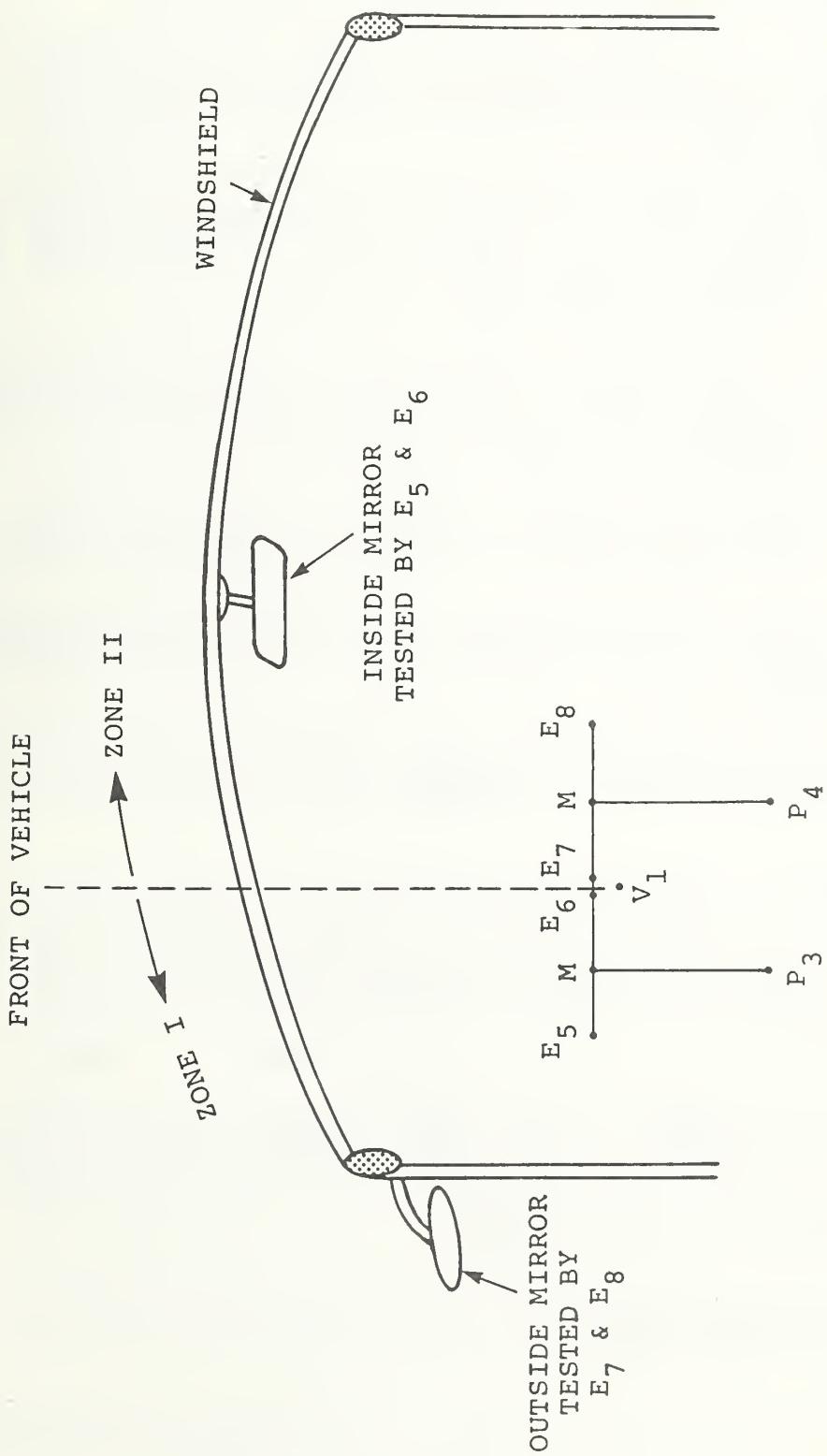


Figure A-4. Top View of V, E & P Points.

8. If the angle in Step 7 is less than  $330^\circ$ , set the telescope to a horizontal angle reading of  $330^\circ$ . Remove the clamp holding the E and P plates together. Rotate the E plate until the left side vertical midpoint is again in view. Replace the clamp holding the plate together. If the angle observed earlier was greater than  $330^\circ$ , do not disturb the original relationship between the E and P plates, but begin measurements at that point.
- 9.\* (Repeatability Measurement.) With the theodolite at E8, shoot through the geometric center of the mirror to Target SL (or XL), mark and label this point on the target board.
10. With the E and P plates remaining clamped, swing the telescope to  $90^\circ$  and establish a benchmark on some distant object to aid in repositioning the theodolite to E7. The distant point will lie on an extension of the line passing through points E7 and E8.
11. Remove the theodolite from the E8 hole and place it in the E7 hole. Set the horizontal angle reading to  $90^\circ$  and flip the clutch lever to hold this reading. Level the instrument and aim the telescope at the benchmark established in Step 10. Release the clutch.
12. Now swing the telescope clockwise until the line of sight is on the vertical midpoint on the right side of the same image display. Record the horizontal angle.
- 12A.\* (Repeatability Measurement.) With the theodolite at E7, shoot through the geometric center of the mirror to Target SL (or XL), mark and label this point on the target board.
13. Install a camera in hole E8 so that the lens is at the same elevation and sighting along the same line as in Step 8. Lens must be located on a vertical line through E8.
14. Focus the camera and photograph the target image.
15. Move the camera to hole E7 so that the lens is at the same elevation and sighting along the same line as in Step 12. Lens must be located on a vertical line through E7.
16. Focus the camera and photograph the target image.
17. Shoot a picture of the target board (directly, i.e., carry the camera to the board) showing the total target board with the points marked and labeled in Steps 9 and 12A. Note: Leave marked points on the target for the duration of this program.

---

\*Needed only for unit mirrors.

## L.0 AMBINOCULAR FIELD OF VIEW (ZONE II)

NOTE: Refer to Figure 3.

1. Install the P plate. (Note: P plate to be used for indirect fields of view has holes P3 and P4 stamped on it.) After attaching the P plate, insert the shaft of the E plate in the P3 hole of the P plate. Insert the referencing pin in the bottom of the P plate and through the E plate (this aligns the axis of the E plate parallel to that of the P plate and thus also parallel to the Zero Y plate). Clamp the two plates together at this time to aid in further setup.
2. Install the theodolite in the E5 hole (see Figure 3).
3. Set up the plumb bob at the front of the car so that it is the distance from the vehicle centerline (Zero Y plane) shown in Column 3, Table B-4.
4. Level the theodolite and adjust the horizontal angle reading so the plumb bob is at the zero position.
5. Verify that the instrument is at the height shown in Column 4 of Table B-4.
6. Read the vertical angle, horizontal angle, and distance to the geometric center of the mirror. Record data.
7. Rotate the telescope to the three o'clock position ( $90^\circ$ ) then sweep counterclockwise until the vertical midpoint on the right side of the image area is encountered. Read the angle on the horizontal circle and record angle and distance on Data Sheet 5.
8. If the angle in Step 7 is greater than  $30^\circ$ , set the telescope to a horizontal angle reading of  $30^\circ$ . Remove the clamp holding E and P plates together. Rotate the E plate until the right side vertical midpoint is again in view. Replace the clamp holding the plate together. If the angle observed earlier was less than  $30^\circ$ , do not disturb the original relationship between the E and P plates, but begin the measurements at that point.
- 9.\* (Repeatability Measurement.) With the theodolite at E5, shoot through the geometric center of the mirror to Target SR (or XR), mark and label this point on the target board.
10. With the E and P plates remaining clamped, swing the telescope to  $90^\circ$  and establish a benchmark on some distant object to aid in repositioning the theodolite to E6. The distant point will lie on an extension of the line passing through points E5 and E6.

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\*Needed only for unit mirrors.

11. Remove the theodolite from the E5 hole and place it in the E6 hole. Set the horizontal angle reading to 90° and flip the clutch lever to hold this reading. Level the instrument and aim the telescope at the benchmark established in Step 10. Release the clutch.
12. Now swing the telescope clockwise until the line of sight is on the vertical midpoint on the left side of the same image display. Record the horizontal angle.
- 12A.\* (Repeatability Measurement.) With the theodolite at E6, shoot through the geometric center of the mirror to Target SR (or XR), mark and label this point on the target board.
13. Install a camera in hole E5 so that the lens is at the same elevation and sighting along the same line as in Step 8. Lens must be located on a vertical line through E5.
14. Focus the camera and photograph the target image.
15. Move the camera to hole E6 so that the lens is at the same elevation and sighting along the same line as in Step 12. Lens must be located on a vertical line through E6.
16. Focus the camera and photograph the target image.
17. Repeat Steps 2 through 16 for all unit mirrors in Zone II.
18. Shoot a picture of the target board (directly, i.e., carry the camera to the board) showing the total target board with the points marked and labeled in Steps 9 and 12A. NOTE: Leave marked points on the target board for the duration of this program.

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\*Needed only for unit mirrors.

APPENDIX B  
AMC CONCORD

This appendix contains all the data for the three tests conducted on the AMC Condord. The appendix is organized as follows.

<u>Page No.</u>	<u>Description</u>
B-3	Figures B1 and B-2 are views of the test vehicle
B-4	Figure B-3 provides dimensions for Direct Field of View Reference Points
B-5	Figure B-4 provides dimensions for Rearview Mirror Measurement Reference Points
B-6	Vehicle Data Sheet; Test No. 1
B-7-B14	Direct Field of View Data; Test No. 1
B-15-B-19	Rear View Mirror Data; Test No. 1
B-20	Vehicle Data Sheet,; Test No. 2
B-21-B-28	Direct Field of View Data; Test No. 2
B-29-B-33	Rearview Mirror Data; Test No. 2
B-34	Vehicle Data Sheet; Test No. 3
B-35-B-42	Direct Field of View Data; Test No. 3
B-43-B-47	Rearview Mirror Data; Test No. 3



Figure B-1. AMC Concord Right Front Quarter View.



Figure B-2. AMC Concord Left Front Quarter View.

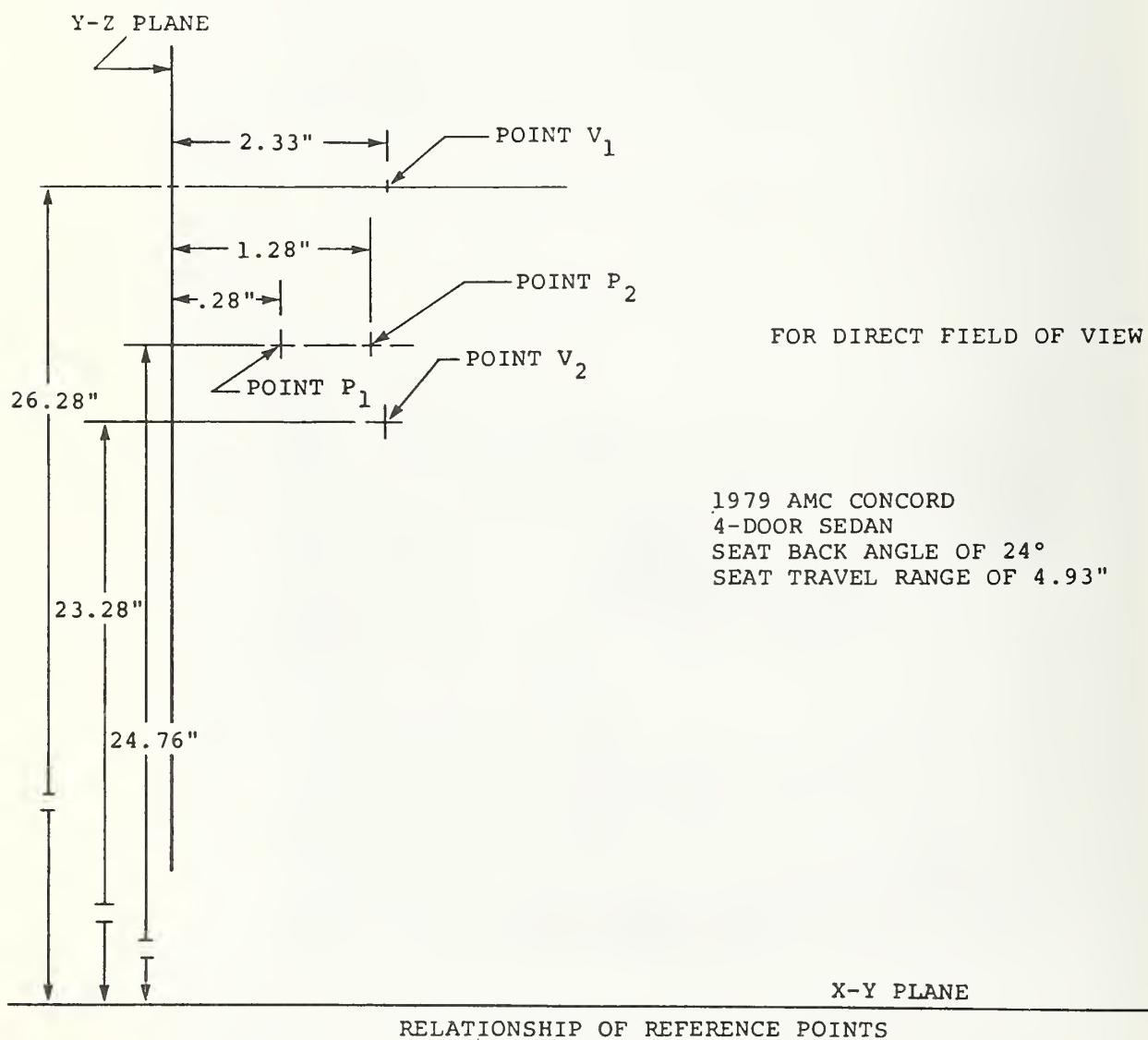
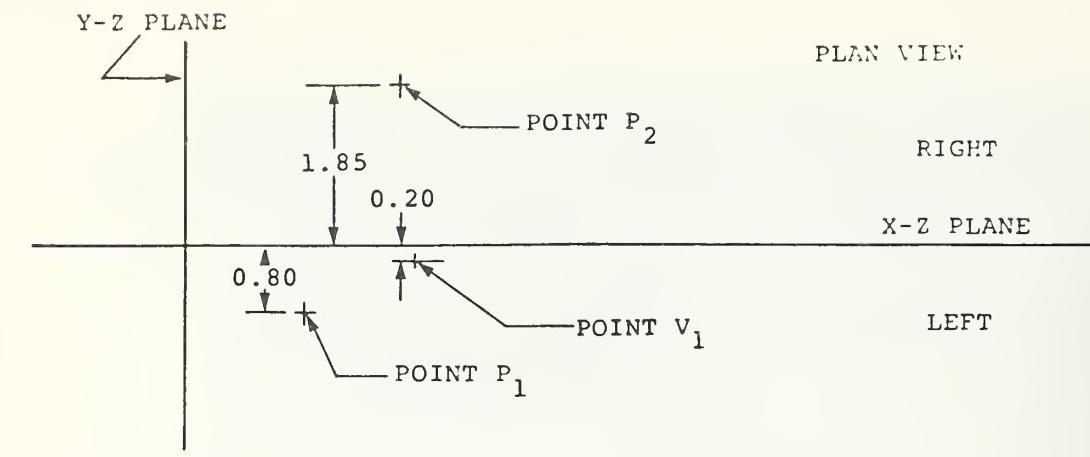


Figure B-3. Relationship of Reference Points for Direct Field of View.

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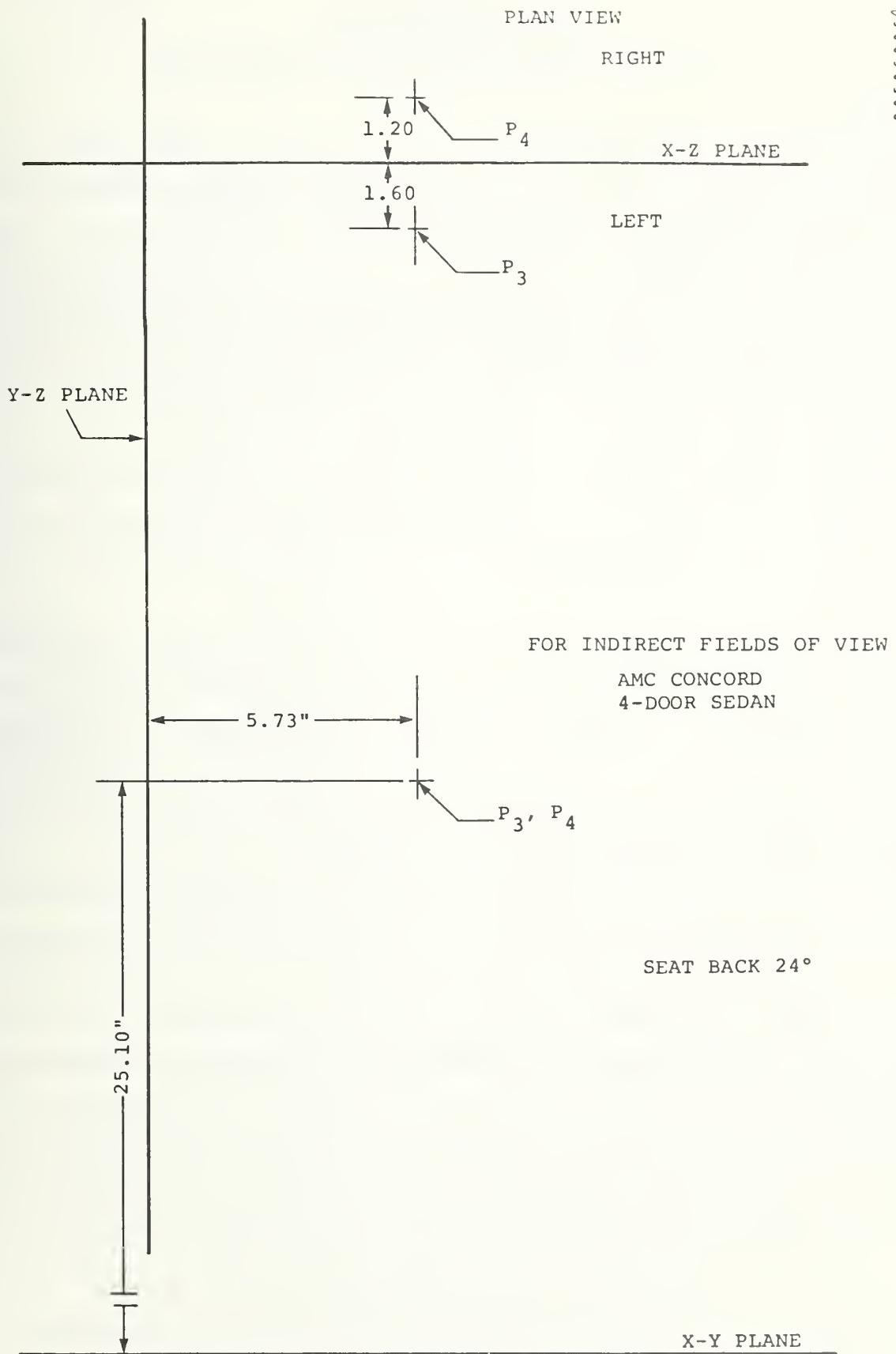


Figure B-4. Relationship of Reference Points for Rearview Mirror Measurements.

## DATA SHEET NO. 1

## VEHICLE DATA

## VEHICLE:

MANUFACTURER American Motors YEAR 1979  
 MODEL Concord BODY STYLE 4-Door Sedan  
 VIN A9A057H138532 ODOMETER 8143.6  
 BUILD DATE 9/28/78  
 SPECIAL OPTIONS 304 CID engine, air conditioning, right-hand  
convex experimental mirror.  
 FRONT SEAT TYPE: ACTUAL Bucket  
 TILT STEERING WHEEL? YES        NO X  
 FRONT SEAT TRAVEL RANGE: SPECIFIED 4.93 in.  
 FRONT SEAT BACK ANGLE: SPECIFIED 24°

## MEASURING POINT CORRECTIONS

	X (in.)	Z (in.)
P From Table 2	-0.88	--
P From Table 3	-0.34	.10
Total P	-1.22	.10
V From Table 3	-0.34	.10

## MANUFACTURER'S REFERENCE POINTS FOR R POINT

For X 44.36 to Y-Z Plane                   
 For Y 12.50 to X-Z Plane                   
 For Z 10.85 to X-Y Plane                 

## MANUFACTURER'S REFERENCE POINTS FOR VEHICLE ATTITUDE (1 passenger)

FRONT Fiducial mark to ground = 8.923 in.

REAR Fiducial mark to ground = 8.161 in.

Front SRP to ground = 19.051 in.

DATA SHEET 2A  
MONOCULAR OBSTRUCTION ANGLE FROM V1  
TEST 1

VEHICLE:

MANUFACTURER American Motors YEAR 1979  
 MODEL Concord BODY STYLE 4-Door Sedan  
 VIN A9A057H138532

LOCATION OF "V" POINT RELATIVE TO THE "R" POINT

	V <sub>1</sub>	V <sub>2</sub>
X	2.33	2.33
Y	-0.20	-0.20
Z	26.28	23.28

OBSTRUCTIONS: Zone I

Elevation	Obstruction	Left Angle	Right Angle	Obstruction Angle
V1	Left A-Pillar	320° 45'	330° 19'	9° 34'

Total 9° 34'

Explanations Pertinent to the Specific Measurements:

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DATA SHEET 2 A  
MONOCULAR OBSTRUCTION ANGLE FROM V1  
TEST 1

VEHICLE:

MANUFACTURER	American Motors	YEAR	1979
MODEL	Concord	BODY STYLE	4-Door Sedan
VIN	A9A057H138532		

LOCATION OF "V" POINT RELATIVE TO THE "R" POINT

	V <sub>1</sub>	V <sub>2</sub>
X	2.33	2.33
Y	-0.20	-0.20
Z	26.28	23.28

OBSTRUCTIONS: Zone II

Elevation	Obstruction	Left Angle	Right Angle	Obstruction Angle
V1	Right A-Pillar	61° 02'	67° 43'	6° 41'

Total 6° 41'

Explanations Pertinent to the Specific Measurements:

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DATA SHEET 2 A  
MONOCULAR OBSTRUCTION ANGLE FROM V1  
TEST 1

VEHICLE:

MANUFACTURER American Motors YEAR 1979  
 MODEL Concord BODY STYLE 4-Door Sedan  
 VIN A9A057H138532

LOCATION OF "V" POINT RELATIVE TO THE "R" POINT

	V <sub>1</sub>	V <sub>2</sub>
X	2.33	2.33
Y	-0.20	-0.20
Z	26.28	23.28

OBSTRUCTIONS: Zone IV

<u>Elevation</u>	<u>Obstruction</u>	<u>Left Angle</u>	<u>Right Angle</u>	<u>Obstruction Angle</u>
V1	Right B-Pillar	94° 51'	102° 08'	7° 17'
V1	Right C-Pillar	125° 37'	143° 09'	17° 32'

Total 24° 49'

Explanations Pertinent to the Specific Measurements:

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DATA SHEET 2B  
MONOCULAR OBSTRUCTION ANGLE FROM V2  
TEST 1

VEHICLE:

MANUFACTURER American Motors YEAR 1979  
 MODEL Concord BODY STYLE 4-Door Sedan  
 VIN A9A057H138532

LOCATION OF "V" POINT RELATIVE TO THE "R" POINT

	V <sub>1</sub>	V <sub>2</sub>
X	2.33	2.33
Y	-0.20	-0.20
Z	26.28	23.28

OBSTRUCTIONS: Zone I

<u>Elevation</u>	<u>Obstruction</u>	<u>Left Angle</u>	<u>Right Angle</u>	<u>Obstruction Angle</u>
V2	Left A-Pillar	323° 52'	332° 04'	8° 12'

Total 8° 12'

Explanations Pertinent to the Specific Measurements:

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DATA SHEET 2 B  
MONOCULAR OBSTRUCTION ANGLE FROM V2  
TEST 1

VEHICLE:

MANUFACTURER American Motors YEAR 1979  
 MODEL Concord BODY STYLE 4-Door Sedan  
 VIN A9A057H138532

LOCATION OF "V" POINT RELATIVE TO THE "R" POINT

	V <sub>1</sub>	V <sub>2</sub>
X	2.33	2.33
Y	-0.20	-0.20
Z	26.28	23.28

OBSTRUCTIONS: Zone II

<u>Elevation</u>	<u>Obstruction</u>	<u>Left Angle</u>	<u>Right Angle</u>	<u>Obstruction Angle</u>
V2	Right A-Pillar	57° 26'	63° 40'	6° 14'

Total 6° 14'

Explanations Pertinent to the Specific Measurements:

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DATA SHEET 2B  
MONOCULAR OBSTRUCTION ANGLE FROM V2  
TEST 1

VEHICLE:

MANUFACTURER American Motors YEAR 1979  
 MODEL Concord BODY STYLE 4-Door Sedan  
 VIN A9A057H138532

LOCATION OF "V" POINT RELATIVE TO THE "R" POINT

	<u>V<sub>1</sub></u>	<u>V<sub>2</sub></u>
X	2.33	2.33
Y	-0.20	-0.20
Z	26.28	23.28

OBSTRUCTIONS: Zone IV

<u>Elevation</u>	<u>Obstruction</u>	<u>Left Angle</u>	<u>Right Angle</u>	<u>Obstruction Angle</u>
V2	Right B-Pillar	94° 14'	102° 06'*	7° 52'
V2	Right C-Pillar	126° 30'	144° 50'	18° 20'

Total 26° 12'

Explanations Pertinent to the Specific Measurements:

\*Includes a portion of the D-ring on the seat belt assembly.

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DATA SHEET 4  
BINOCULAR OBSTRUCTION ANGLES  
TEST 1

**VEHICLE:**

MANUFACTURER American Motors YEAR 1979  
 MODEL Concord BODY STYLE 4-Door Sedan  
 VIN A9A057H138532

	Dimensions Relative to R		
	X	Y	Z
P <sub>1</sub>	0.28	-0.80	24.76
P <sub>2</sub>	1.28	1.85	24.76

Zone: I

Obstruction Left A-Pillar

Initial Sight to Outboard E - Rear Side	<u>315° 03'</u>	_____	_____
Adjusted Sight to Outboard E - Rear Side	<u>330° 00'</u>	_____	_____
Inboard E - Front Side	<u>335° 24'</u>	_____	_____
Angle to Bench Mark	<u>90° 00'</u>	_____	_____
Obstruction Angle	<u>5° 24'</u>	_____	_____
Azimuth	_____	_____	_____

Zone: \_\_\_\_\_

Obstruction Right A-Pillar

Initial Sight to Outboard E - Rear Side	<u>70° 29'</u>	_____	_____
Adjusted Sight to Outboard E - Rear Side	<u>30° 00'</u>	_____	_____
Inboard E - Front Side	<u>25° 53'</u>	_____	_____
Angle to Bench Mark	<u>270° 00'</u>	_____	_____
Obstruction Angle	<u>4° 07'</u>	_____	_____
Azimuth	_____	_____	_____

Explanations Pertinent to the Specific Measurements:

The obstruction angles were taken to the extreme outer edges of  
 the glue lines. The obstruction angles on the felt edges were  
 taken to the line on the felt where there were no holes.

60L66

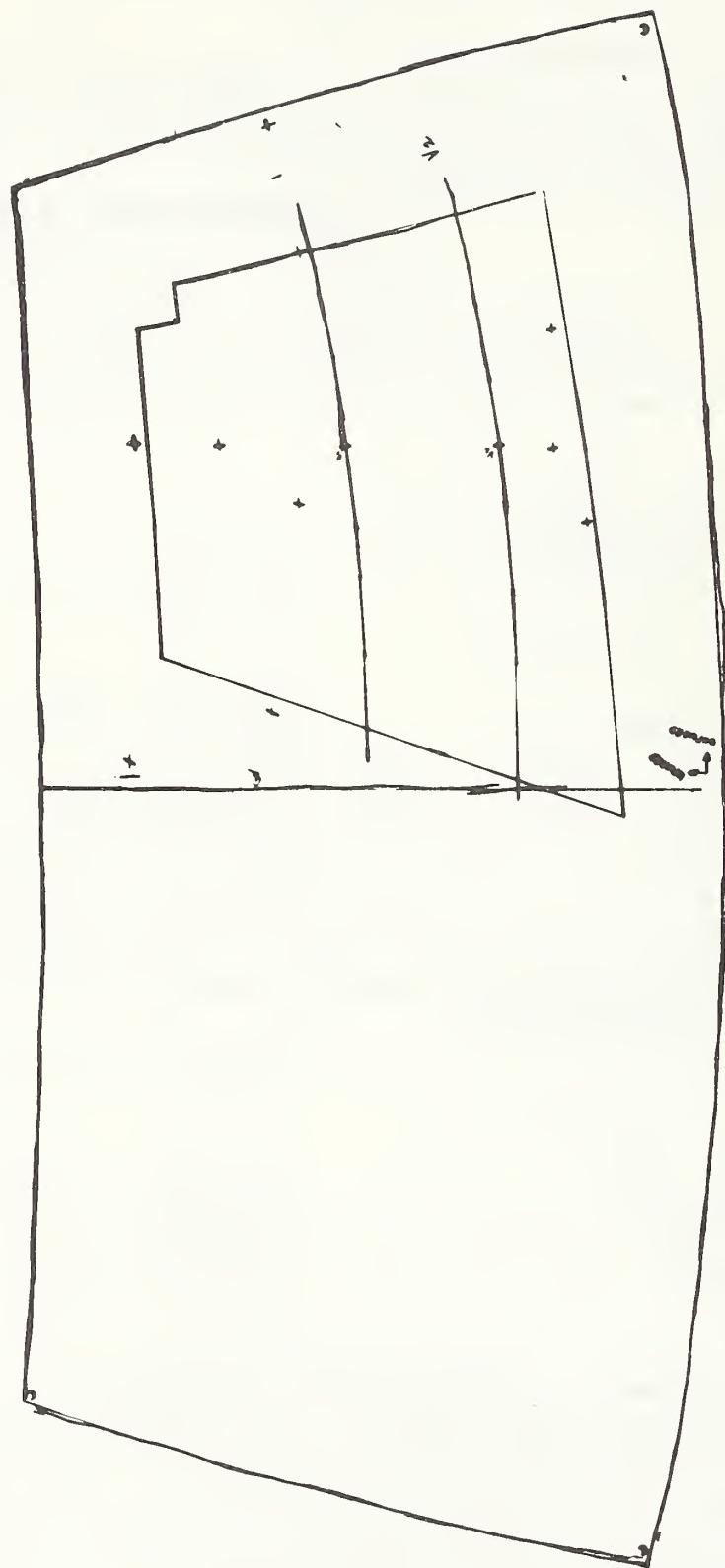


Figure B-5. AMC Concord Test No. 1. view Area A.

### Ambinocular Fields of View

The sketches on Page B-5 show the location of the P points relative to the R point. Angular measurements from approximate E points to the mirrors are shown for information only in Data Sheet 5 (see page B-16).

Measured data is compared with the requirements below.

	Left Outside Unit Mirror		Right Outside Unit Mirror		Interior Rearview Mirror	
	E7	E8	E5	E6	E5	E6
Test 1 Area (ft <sup>2</sup> )	12.7	11.1	19.5	18.5	27.2	21.0
Net Percent		61		71		82
Required by Docket No. 71- 3a Notice 4	75% of Target SL (Unit Mir- ror)		75% of Target SR (Unit Mir- ror)		75% of Target Q (Unit Mir- ror)	

NOTE: Mirrors were not necessarily positioned to view the maximum amount of target. Instead, to meet the goals of this program, they were positioned in a standard manner (see Appendix A) in order to evaluate repeatability in positioning the mirror.

Photographs of the views to the flat mirrors from the various eyepoints are included as Figures B-6 through B-11.

DATA SHEET 5  
AMBINOCULAR FIELD OF VIEW  
TEST 1

**VEHICLE:**

<b>MANUFACTURER</b>	American Motors Corporation	<b>YEAR</b>	1979
<b>MODEL</b>	Concord	<b>BODY STYLE</b>	4-Door Sedan
<b>VIN</b>	A9A057H138532		

	Dimensions Relative to R-Point		
	X	Y	Z
P <sub>3</sub>	5.73	-1.60	25.10
P <sub>4</sub>	5.73	+1.20	25.10

**Zone:** I\*

<b>Obstruction</b>	Left Outside Mirror	
E <sub>8</sub> - Initial Sight to Vertical Midpoint - Left Side	304° 14'	
E <sub>8</sub> - Adjusted Sight to Vertical Midpoint - Left Side	330° 00'	
Angle to Bench Mark	90° 00'	
E <sub>7</sub> - Angle to Vertical Midpoint - Right Side	343° 58'	
<b>Azimuth</b>		

**Zone:** II\*\*

<b>Obstruction</b>	Interior Rearview Mirror	Right Outside Mirror
E <sub>5</sub> - Initial Sight to Vertical Midpoint - Right Side	52° 37'	71° 24'
E <sub>5</sub> - Adjusted Sight to Vertical Midpoint - Right Side	30° 0'	30° 0'
Angle to Bench Mark	270°	270°
E <sub>6</sub> - Angle to Vertical Midpoint - Left Side	359° 56'	23° 12'
<b>Azimuth</b>		

**Explanations Pertinent to the Specific Measurements:**

\*Use P<sub>4</sub> hole for E Plate.

\*\*Use P<sub>3</sub> hole for E plate.



Figure B-6. AMC Concord Test No. 1 Left Flat Mirror From E8.



Figure B-7. AMC Concord Test No. 1 Left Flat Mirror From E7.



Figure B-8. AMC Concord Test No. 1 Interior Rearview Mirror From E5.



Figure B-9. AMC Concord Test No. 1 Interior Rearview Mirror From E6.



Figure B-10. AMC Concord Test No. 1 Right Flat Mirror From E6.



Figure B-11. AMC Concord Test No. 1 Right Flat Mirror From E5.

7/12/79

## DATA SHEET NO. 1

## VEHICLE DATA

## TEST 2

## VEHICLE:

MANUFACTURER American Motors Corporation YEAR 1979  
 MODEL Concord BODY STYLE 4-Door Sedan  
 VIN A9A057H138532 ODOMETER >8143.6  
 BUILD DATE 9/28/78  
 SPECIAL OPTIONS 304 CID engine, air conditioning, right-hand convex experimental mirror

FRONT SEAT TYPE:	ACTUAL	Bucket
TILT STEERING WHEEL?	YES	NO <input checked="" type="checkbox"/>
FRONT SEAT TRAVEL RANGE:	SPECIFIED	4.93 in.
FRONT SEAT BACK ANGLE:	SPECIFIED	24°

## MEASURING POINT CORRECTIONS

	X (in.)	Z (in.)
P From Table 2	-0.88	--
P From Table 3	-0.34	+0.10
Total P	-1.22	+0.10
V From Table 3	-0.34	+0.10

## MANUFACTURER'S REFERENCE POINTS FOR R POINT

For X <u>44.36</u>	to Y-Z Plane
For Y <u>12.50</u>	to X-Z Plane
For Z <u>10.85</u>	to X-Y Plane

## MANUFACTURER'S DIMENSIONS FOR VEHICLE ATTITUDE (1-PASSENGER)

	From Zero X-Plane	From Zero Y-Plane	Height Above Ground
Front Fiducial Station	+ 9.68	26.38	8.923
Rear Fiducial Station	+62.26	26.22	8.161
"R" Point	+44.36	-12.50	19.051

DATA SHEET 2A  
MONOCULAR OBSTRUCTION ANGLE FROM V1  
TEST 2

VEHICLE:

MANUFACTURER American Motors Corporation YEAR 1979  
 MODEL Concord BODY STYLE 4-Door Sedan  
 VIN A9A057H138532

LOCATION OF "V" POINT RELATIVE TO THE "R" POINT

	V <sub>1</sub>	V <sub>2</sub>
X	2.33	2.33
Y	-0.20	-0.20
Z	26.28	23.28

OBSTRUCTIONS: Zone 1

<u>Elevation</u>	<u>Obstruction</u>	<u>Left Angle</u>	<u>Right Angle</u>	<u>Obstruction Angle</u>
V1	Left A-Pillar	320° 39'	330° 11'	9° 32'

Total 9° 32'

Explanations Pertinent to the Specific Measurements:

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DATA SHEET 2A  
MONOCULAR OBSTRUCTION ANGLE FROM V1  
TEST 2

VEHICLE:

MANUFACTURER American Motors Corporation YEAR 1979  
 MODEL Concord BODY STYLE 4-Door Sedan  
 VIN A9A057H138532

LOCATION OF "V" POINT RELATIVE TO THE "R" POINT

	V1	V2
X	2.33	2.33
Y	-0.20	-0.20
Z	26.28	23.28

OBSTRUCTIONS: Zone 2

<u>Elevation</u>	<u>Obstruction</u>	<u>Left Angle</u>	<u>Right Angle</u>	<u>Obstruction Angle</u>
V1	Antenna	44° 27'	44° 37'	0° 10'
V1	Right A-Pillar	60° 57'	67° 37'	6° 40'

Total 6° 50'

Explanations Pertinent to the Specific Measurements:

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DATA SHEET 2A  
MONOCULAR OBSTRUCTION ANGLE FROM V1  
TEST 2

**VEHICLE:**

MANUFACTURER American Motors Corporation YEAR 1979  
 MODEL Concord BODY STYLE 4-Door Sedan  
 VIN A9A057H138532

LOCATION OF "V" POINT RELATIVE TO THE "R" POINT

	V1	V2
X	2.33	2.33
Y	-0.20	-0.20
Z	26.28	23.28

OBSTRUCTIONS: Zone 4

Elevation	Obstruction	Left Angle	Right Angle	Obstruction Angle
V1	Right B-Pillar	94° 48'	102° 05'	7° 17'
V1	Right C-Pillar	125° 29'	142° 59'	17° 30'

Total 24° 47'

Explanations Pertinent to the Specific Measurements:

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DATA SHEET 2B  
MONOCULAR OBSTRUCTION ANGLE FROM V 2  
TEST 2

VEHICLE:

MANUFACTURER American Motors Corporation YEAR 1979  
 MODEL Concord BODY STYLE 4-Door Sedan  
 VIN A9A057H138532

LOCATION OF "V" POINT RELATIVE TO THE "R" POINT

	V <sub>1</sub>	V <sub>2</sub>
X	2.33	2.33
Y	-0.20	-0.20
Z	26.28	23.28

OBSTRUCTIONS: Zone \_\_\_\_\_

<u>Elevation</u>	<u>Obstruction</u>	<u>Left Angle</u>	<u>Right Angle</u>	<u>Obstruction Angle</u>
V2	Left A-Pillar	324° 02'	332° 12'	8° 10'

Total 8° 10'

Explanations Pertinent to the Specific Measurements:

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DATA SHEET 2B  
MONOCULAR OBSTRUCTION ANGLE FROM V2  
TEST 2

VEHICLE:

MANUFACTURER American Motors Corporation YEAR 1979  
 MODEL Concord BODY STYLE 4-Door Sedan  
 VIN A9A057H138532

LOCATION OF "V" POINT RELATIVE TO THE "R" POINT

	V <sub>1</sub>	V <sub>2</sub>
X	2.33	2.33
Y	-0.20	-0.20
Z	26.28	23.28

OBSTRUCTIONS: Zone 2

<u>Elevation</u>	<u>Obstruction</u>	<u>Left Angle</u>	<u>Right Angle</u>	<u>Obstruction Angle</u>
V2	Antenna	44° 44'	44° 54'	0° 10'
V2	Right A-Pillar	57° 25'	63° 39'	6° 14'

Total 6° 24'

Explanations Pertinent to the Specific Measurements:

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DATA SHEET 2B  
MONOCULAR OBSTRUCTION ANGLE FROM V2  
TEST 2

VEHICLE:

MANUFACTURER American Motors Corporation YEAR 1979  
 MODEL Concord BODY STYLE 4-Door Sedan  
 VIN A9A057H138532

LOCATION OF "V" POINT RELATIVE TO THE "R" POINT

	<u>V<sub>1</sub></u>	<u>V<sub>2</sub></u>
X	2.33	2.33
Y	-0.20	-0.20
Z	26.28	23.28

OBSTRUCTIONS: Zone 4

<u>Elevation</u>	<u>Obstruction</u>	<u>Left Angle</u>	<u>Right Angle</u>	<u>Obstruction Angle</u>
V2	Right B-Pillar	94° 14'	102° 05'*	7° 51'
V2	Right C-Pillar	126° 23'	144° 47'	18° 24'

Total 26° 15'

Explanations Pertinent to the Specific Measurements:

\*Includes portion of D-ring on seat belt assembly.

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DATA SHEET 4  
BINOCULAR OBSTRUCTION ANGLES  
TEST 2

**VEHICLE:**

MANUFACTURER American Motors Corporation YEAR 1979  
 MODEL Concord BODY STYLE 4-Door Sedan  
 VIN A9A057H138532

	Dimensions Relative to R		
	X	Y	Z
P <sub>1</sub>	0.28	-0.80	24.76
P <sub>2</sub>	1.28	1.85	24.76

Zone: I

Obstruction Left A-Pillar

Initial Sight to Outboard E - Rear Side	<u>314° 58'</u>		
Adjusted Sight to Outboard E - Rear Side	<u>330° 00'</u>		
Inboard E - Front Side	<u>335° 40'</u>		
Angle to Bench Mark	<u>90° 00'</u>		
Obstruction Angle	<u>5° 40'</u>		
Azimuth			

Zone: II

Obstruction Right A-Pillar

Initial Sight to Outboard E - Rear Side	<u>70° 12'</u>		
Adjusted Sight to Outboard E - Rear Side	<u>30° 00'</u>		
Inboard E - Front Side	<u>25° 50'</u>		
Angle to Bench Mark	<u>270° 00'</u>		
Obstruction Angle	<u>4° 10'</u>		
Azimuth			

Explanations Pertinent to the Specific Measurements:

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90166

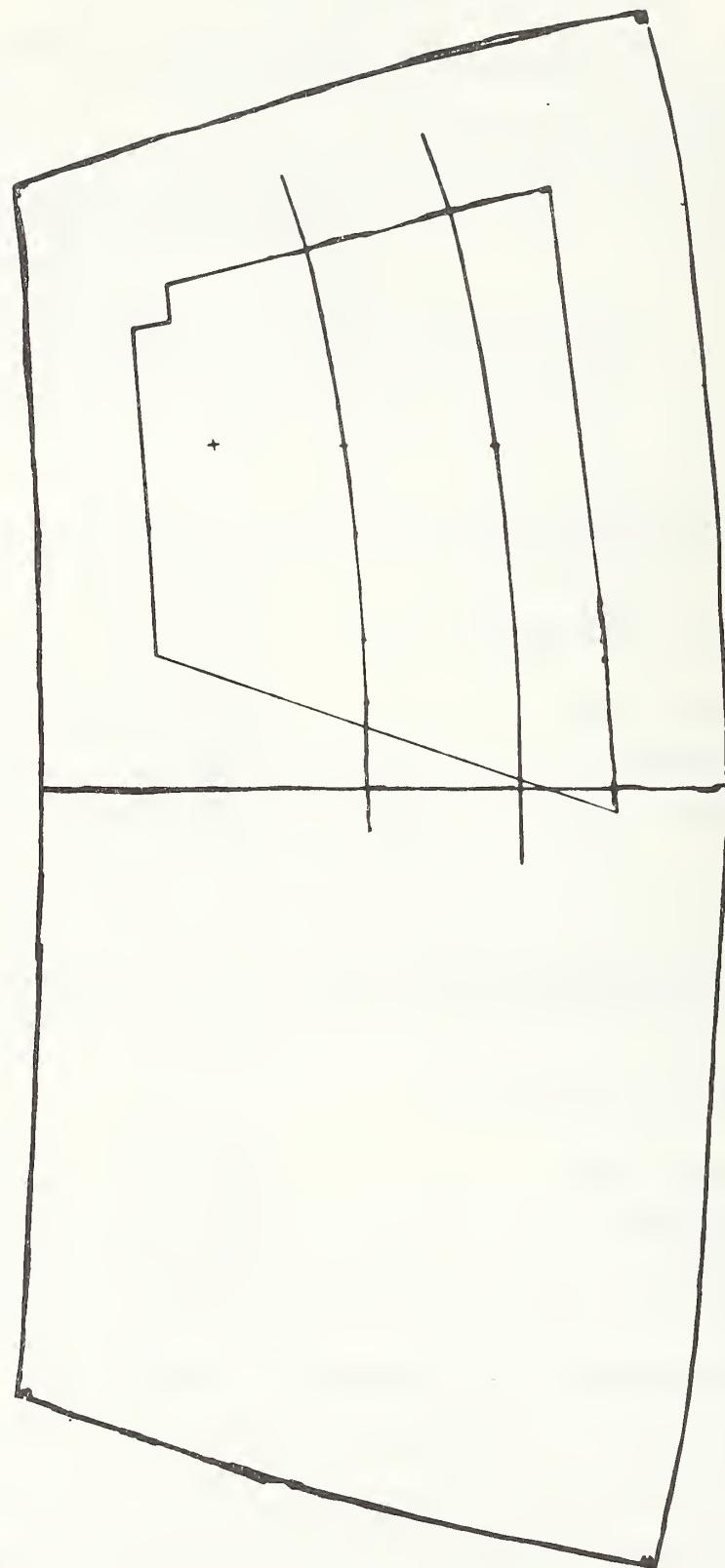


Figure B-12. AMC Concord Test No. 2. View Area A.

### Ambinocular Fields of View

The sketches on Page B-5 show the location of the P points relative to the R point. Angular measurements from approximate E points to the mirrors are shown for information only in Data Sheet 5 (see page B-30).

Measured data is compared with the requirements below.

	Left Outside Unit Mirror		Right Outside Unit Mirror		Interior Rearview Mirror	
	E7	E8	E5	E6	E5	E6
Test 2 Area (ft <sup>2</sup> )	12.5	10.7	21.0	22.2	30.0	22.9
Net Percent		60		84		87
Required by Docket No. 71- 3a Notice 4	75% of Target SL (Unit Mir- ror)		75% of Target SR (Unit Mir- ror)		75% of Target Q (Unit Mir- ror)	

NOTE: Mirrors were not necessarily positioned to view the maximum amount of target. Instead, to meet the goals of this program, they were positioned in a standard manner (see Appendix A) in order to evaluate repeatability in positioning the mirror.

Photographs of the views to the flat mirrors from the various eyepoints are included as Figures B-13 through B-18.

DATA SHEET 5  
AMBINOCULAR FIELD OF VIEW  
TEST 2

**VEHICLE:**

MANUFACTURER American Motors Corporation YEAR 1979  
 MODEL Concord BODY STYLE 4-Door Sedan  
 VIN A9A057H138532

	Dimensions Relative to R-Point		
	X	Y	Z
P <sub>3</sub>	5.73	-1.60	25.10
P <sub>4</sub>	5.73	+1.20	25.10

Zone: I\*

Obstruction	Left Outside Mirror	
E <sub>8</sub> - Initial Sight to Vertical Midpoint - Left Side	303° 55'	
E <sub>8</sub> - Adjusted Sight to Vertical Midpoint - Left Side	330° 00'	
Angle to Bench Mark	90°	
E <sub>7</sub> - Angle to Vertical Midpoint - Right Side	344° 06'	

**Azimuth**

Zone: <u>II**</u>	Interior Rearview Mirror	Right Outside Mirror
Obstruction		
E <sub>5</sub> - Initial Sight to Vertical Midpoint - Right Side	52° 20'	71° 35'
E <sub>5</sub> - Adjusted Sight to Vertical Midpoint - Right Side	30° 0'	30° 0'
Angle to Bench Mark	270°	270°
E <sub>6</sub> - Angle to Vertical Midpoint - Left Side	359° 32'	22° 54'
<b>Azimuth</b>		

**Explanations Pertinent to the Specific Measurements:**

\*Use P<sub>4</sub> hole for E Plate.  
 \*\*Use P<sub>3</sub> hole for E plate.



Figure B-13. AMC Concord Test No. 2 Left Flat Mirror From E8.



Figure B-14. AMC Concord Test No. 2 Left Flat Mirror From E7.



Figure B-15. AMC Concord Test No. 2 Interior Rearview Mirror From E5.



Figure B-16. AMC Concord Test No. 2 Interior Rearview Mirror From E6.



Figure B-17. AMC Concord Test No. 2 Right Flat Mirror From E6.



Figure B-18. AMC Concord Test No. 2 Right Flat Mirror From E5.

## DATA SHEET NO. 1

## VEHICLE DATA

## TEST 3

## VEHICLE:

MANUFACTURER American Motors Corporation YEAR 1979MODEL Concord BODY STYLE 4-Door SedanVIN A9A057H138532 ODOMETER >8143.6BUILD DATE 9/28/78SPECIAL OPTIONS 304 CID engine, air conditioning, right-hand convex experimental mirrorFRONT SEAT TYPE: SPECIFIED BucketTILT STEERING WHEEL? YES        NO XFRONT SEAT TRAVEL RANGE: SPECIFIED 4.93FRONT SEAT BACK ANGLE: SPECIFIED 24°

## MEASURING POINT CORRECTIONS

	X (in.)	Z (in.)
P From Table 2	-0.88	--
P From Table 3	-0.34	+0.10
Total P	-1.22	+0.10
V From Table 3	-0.34	+0.10

## MANUFACTURER'S REFERENCE POINTS FOR R POINT

For X	<u>44.36</u>	to Y-Z Plane	<u>                </u>
For Y	<u>12.50</u>	to X-Z Plane	<u>                </u>
For Z	<u>10.85</u>	to X-Y Plane	<u>                </u>

## MANUFACTURER'S DIMENSIONS FOR VEHICLE ATTITUDE (1-PASSENGER)

	From Zero X-Plane	From Zero Y-Plane	Height Above Ground
Front Fiducial Station	+ 9.68	26.38	8.923
Rear Fiducial Station	62.26	26.22	8.161
"R" Point	44.36	-12.50	19.051

DATA SHEET 2  
MONOCULAR OBSTRUCTION ANGLE FROM V1  
TEST 3

VEHICLE:

MANUFACTURER American Motors Corporation YEAR 1979  
 MODEL Concord BODY STYLE 4-Door Sedan  
 VIN A9A057H138532

LOCATION OF "V" POINT RELATIVE TO THE "R" POINT

	V <sub>1</sub>	V <sub>2</sub>
X	2.33	2.33
Y	-0.20	-0.20
Z	26.28	23.28

OBSTRUCTIONS: Zone I

<u>Elevation</u>	<u>Obstruction</u>	<u>Left Angle</u>	<u>Right Angle</u>	<u>Obstruction Angle</u>
V1	Left A-Pillar	320° 33'	330° 09'	9° 36'

Total 9° 36'

Explanations Pertinent to the Specific Measurements:

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DATA SHEET 2  
MONOCULAR OBSTRUCTION ANGLE FROM V1  
TEST 3

VEHICLE:

MANUFACTURER American Motors Corporation YEAR 1979  
 MODEL Concord BODY STYLE 4-Door Sedan  
 VIN A9A057H138532

LOCATION OF "V" POINT RELATIVE TO THE "R" POINT

	V <sub>1</sub>	V <sub>2</sub>
X	2.33	2.33
Y	-0.20	-0.20
Z	26.28	23.28

OBSTRUCTIONS: Zone II

Elevation	Obstruction	Left Angle	Right Angle	Obstruction Angle
V1	Antenna	44° 24'	44° 34'	0° 10'
V1	Right A-Pillar	60° 47'	67° 27'	6° 40'

Total 6° 50'

Explanations Pertinent to the Specific Measurements:

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DATA SHEET 2  
MONOCULAR OBSTRUCTION ANGLE FROM V1  
TEST 3

VEHICLE:

MANUFACTURER American Motors Corporation YEAR 1979  
 MODEL Concord BODY STYLE 4-Door Sedan  
 VIN A9A057H138532

LOCATION OF "V" POINT RELATIVE TO THE "R" POINT

	V <sub>1</sub>	V <sub>2</sub>
X	2.33	2.33
Y	-0.20	-0.20
Z	26.28	23.28

OBSTRUCTIONS: Zone I

<u>Elevation</u>	<u>Obstruction</u>	<u>Left Angle</u>	<u>Right Angle</u>	<u>Obstruction Angle</u>
V1	Left A-Pillar	320° 33'	330° 09'	9° 36'

Total 9° 36'

Explanations Pertinent to the Specific Measurements:

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DATA SHEET 2  
MONOCULAR OBSTRUCTION ANGLE FROM V1  
TEST 3

VEHICLE:

MANUFACTURER American Motors Corporation YEAR 1979  
 MODEL Concord BODY STYLE 4-Door Sedan  
 VIN A9A057H138532

LOCATION OF "V" POINT RELATIVE TO THE "R" POINT

	<u>V<sub>1</sub></u>	<u>V<sub>2</sub></u>
X	2.33	2.33
Y	-0.20	-0.20
Z	26.28	23.28

OBSTRUCTIONS: Zone II

<u>Elevation</u>	<u>Obstruction</u>	<u>Left Angle</u>	<u>Right Angle</u>	<u>Obstruction Angle</u>
V1	Antenna	44° 24'	44° 34'	0° 10'
V1	Right A-Pillar	60° 47'	67° 27'	6° 40'

Total 6° 50'

Explanations Pertinent to the Specific Measurements:

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DATA SHEET 2  
MONOCULAR OBSTRUCTION ANGLE FROM V1  
TEST 3

VEHICLE:

MANUFACTURER American Motors Corporation YEAR 1979  
 MODEL Concord BODY STYLE 4-Door Sedan  
 VIN A9A057H138532

LOCATION OF "V" POINT RELATIVE TO THE "R" POINT

	V <sub>1</sub>	V <sub>2</sub>
X	2.33	2.33
Y	-0.20	-0.20
Z	26.28	23.28

OBSTRUCTIONS: Zone I

<u>Elevation</u>	<u>Obstruction</u>	<u>Left Angle</u>	<u>Right Angle</u>	<u>Obstruction Angle</u>
V1	Left A-Pillar	320° 33'	330° 09'	9° 36'

Total 9° 36'

Explanations Pertinent to the Specific Measurements:

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DATA SHEET 2  
MONOCULAR OBSTRUCTION ANGLE FROM V1  
TEST 3

VEHICLE:

MANUFACTURER American Motors Corporation YEAR 1979  
 MODEL Concord BODY STYLE 4-Door Sedan  
 VIN A9A057H138532

LOCATION OF "V" POINT RELATIVE TO THE "R" POINT

	V <sub>1</sub>	V <sub>2</sub>
X	2.33	2.33
Y	-0.20	-0.20
Z	26.28	23.28

OBSTRUCTIONS: Zone II

<u>Elevation</u>	<u>Obstruction</u>	<u>Left Angle</u>	<u>Right Angle</u>	<u>Obstruction Angle</u>
V1	Antenna	44° 24'	44° 34'	0° 10'
V1	Right A-Pillar	60° 47'	67° 27'	6° 40'

Total 6° 50'

Explanations Pertinent to the Specific Measurements:

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DATA SHEET 2  
MONOCULAR OBSTRUCTION ANGLE FROM V1  
TEST 3

**VEHICLE:**

MANUFACTURER American Motors Corporation YEAR 1979  
 MODEL Concord BODY STYLE 4-Door Sedan  
 VIN A9A057H138532

LOCATION OF "V" POINT RELATIVE TO THE "R" POINT

	V <sub>1</sub>	V <sub>2</sub>
X	2.33	2.33
Y	-0.20	-0.20
Z	26.28	23.28

OBSTRUCTIONS: Zone I

<u>Elevation</u>	<u>Obstruction</u>	<u>Left Angle</u>	<u>Right Angle</u>	<u>Obstruction Angle</u>
V1	Left A-Pillar	320° 33'	330° 09'	9° 36'

Total 9° 36'

Explanations Pertinent to the Specific Measurements:

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DATA SHEET 2  
MONOCULAR OBSTRUCTION ANGLE FROM V1  
TEST 3

VEHICLE:

MANUFACTURER American Motors Corporation YEAR 1979  
 MODEL Concord BODY STYLE 4-Door Sedan  
 VIN A9A057H138532

LOCATION OF "V" POINT RELATIVE TO THE "R" POINT

	<u>V<sub>1</sub></u>	<u>V<sub>2</sub></u>
X	2.33	2.33
Y	-0.20	-0.20
Z	26.28	23.28

OBSTRUCTIONS: Zone II

<u>Elevation</u>	<u>Obstruction</u>	<u>Left Angle</u>	<u>Right Angle</u>	<u>Obstruction Angle</u>
V1	Antenna	44° 24'	44° 34'	0° 10'
V1	Right A-Pillar	60° 47'	67° 27'	6° 40'

Total 6° 50'

Explanations Pertinent to the Specific Measurements:

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DATA SHEET 2  
MONOCULAR OBSTRUCTION ANGLE FROM V1  
TEST 3

**VEHICLE:**

MANUFACTURER American Motors Corporation YEAR 1979  
 MODEL Concord BODY STYLE 4-Door Sedan  
 VIN A9A057H138532

LOCATION OF "V" POINT RELATIVE TO THE "R" POINT

	V <sub>1</sub>	V <sub>2</sub>
X	2.33	2.33
Y	-0.20	-0.20
Z	26.28	23.28

OBSTRUCTIONS: Zone I

<u>Elevation</u>	<u>Obstruction</u>	<u>Left Angle</u>	<u>Right Angle</u>	<u>Obstruction Angle</u>
V1	Left A-Pillar	320° 33'	330° 09'	9° 36'

Total 9° 36'

Explanations Pertinent to the Specific Measurements:

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DATA SHEET 2  
MONOCULAR OBSTRUCTION ANGLE FROM V1  
TEST 3

VEHICLE:

MANUFACTURER American Motors Corporation YEAR 1979  
 MODEL Concord BODY STYLE 4-Door Sedan  
 VIN A9A057H138532

LOCATION OF "V" POINT RELATIVE TO THE "R" POINT

	V <sub>1</sub>	V <sub>2</sub>
X	2.33	2.33
Y	-0.20	-0.20
Z	26.28	23.28

OBSTRUCTIONS: Zone II

<u>Elevation</u>	<u>Obstruction</u>	<u>Left Angle</u>	<u>Right Angle</u>	<u>Obstruction Angle</u>
V1	Antenna	44° 24'	44° 34'	0° 10'
V1	Right A-Pillar	60° 47'	67° 27'	6° 40'

Total 6° 50'

Explanations Pertinent to the Specific Measurements:

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DATA SHEET 2  
MONOCULAR OBSTRUCTION ANGLE FROM V1  
TEST 3

VEHICLE:

MANUFACTURER American Motors Corporation YEAR 1979  
 MODEL Concord BODY STYLE 4-Door Sedan  
 VIN A9A057H138532

LOCATION OF "V" POINT RELATIVE TO THE "R" POINT

	V <sub>1</sub>	V <sub>2</sub>
X	2.33	2.33
Y	-0.20	-0.20
Z	26.28	23.28

OBSTRUCTIONS: Zone I

<u>Elevation</u>	<u>Obstruction</u>	<u>Left Angle</u>	<u>Right Angle</u>	<u>Obstruction Angle</u>
V1	Left A-Pillar	320° 33'	330° 09'	9° 36'

Total 9° 36'

Explanations Pertinent to the Specific Measurements:

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## DATA SHEET 2

## MONOCULAR OBSTRUCTION ANGLE FROM V1

TEST 3

## VEHICLE:

MANUFACTURER American Motors Corporation YEAR 1979  
 MODEL Concord BODY STYLE 4-Door Sedan  
 VIN A9A057H138532

## LOCATION OF "V" POINT RELATIVE TO THE "R" POINT

	V1	V2
X	2.33	2.33
Y	-0.20	-0.20
Z	26.28	23.28

OBSTRUCTIONS: Zone II

Elevation	Obstruction	Left Angle	Right Angle	Obstruction Angle
V1	Antenna	44° 24'	44° 34'	0° 10'
V1	Right A-Pillar	60° 47'	67° 27'	6° 40'

Total 6° 50'

## Explanations Pertinent to the Specific Measurements:

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DATA SHEET 2  
MONOCULAR OBSTRUCTION ANGLE FROM V1  
TEST 3

VEHICLE:

MANUFACTURER American Motors Corporation YEAR 1979  
 MODEL Concord BODY STYLE 4-Door Sedan  
 VIN A9A057H138532

LOCATION OF "V" POINT RELATIVE TO THE "R" POINT

	V <sub>1</sub>	V <sub>2</sub>
X	2.33	2.33
Y	-0.20	-0.20
Z	26.28	23.28

OBSTRUCTIONS: Zone I

<u>Elevation</u>	<u>Obstruction</u>	<u>Left Angle</u>	<u>Right Angle</u>	<u>Obstruction Angle</u>
V1	Left A-Pillar	320° 33'	330° 09'	9° 36'

Total 9° 36'

Explanations Pertinent to the Specific Measurements:

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DATA SHEET 2  
MONOCULAR OBSTRUCTION ANGLE FROM V1  
TEST 3

VEHICLE:

MANUFACTURER American Motors Corporation YEAR 1979  
 MODEL Concord BODY STYLE 4-Door Sedan  
 VIN A9A057H138532

LOCATION OF "V" POINT RELATIVE TO THE "R" POINT

	V <sub>1</sub>	V <sub>2</sub>
X	2.33	2.33
Y	-0.20	-0.20
Z	26.28	23.28

OBSTRUCTIONS: Zone II

<u>Elevation</u>	<u>Obstruction</u>	<u>Left Angle</u>	<u>Right Angle</u>	<u>Obstruction Angle</u>
V1	Antenna	44° 24'	44° 34'	0° 10'
V1	Right A-Pillar	60° 47'	67° 27'	6° 40'

Total 6° 50'

Explanations Pertinent to the Specific Measurements:

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DATA SHEET 2  
MONOCULAR OBSTRUCTION ANGLE FROM V1  
TEST 3

**VEHICLE:**

MANUFACTURER American Motors Corporation YEAR 1979  
 MODEL Concord BODY STYLE 4-Door Sedan  
 VIN A9A057H138532

LOCATION OF "V" POINT RELATIVE TO THE "R" POINT

	V <sub>1</sub>	V <sub>2</sub>
X	2.33	2.33
Y	-0.20	-0.20
Z	26.28	23.28

OBSTRUCTIONS: Zone I

Elevation	Obstruction	Left Angle	Right Angle	Obstruction Angle
V1	Left A-Pillar	320° 33'	330° 09'	9° 36'

Total 9° 36'

Explanations Pertinent to the Specific Measurements:

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DATA SHEET 2  
MONOCULAR OBSTRUCTION ANGLE FROM V1  
TEST 3

VEHICLE:

MANUFACTURER American Motors Corporation YEAR 1979  
 MODEL Concord BODY STYLE 4-Door Sedan  
 VIN A9A057H138532

LOCATION OF "V" POINT RELATIVE TO THE "R" POINT

	V <sub>1</sub>	V <sub>2</sub>
X	2.33	2.33
Y	-0.20	-0.20
Z	26.28	23.28

OBSTRUCTIONS: Zone II

<u>Elevation</u>	<u>Obstruction</u>	<u>Left Angle</u>	<u>Right Angle</u>	<u>Obstruction Angle</u>
V1	Antenna	44° 24'	44° 34'	0° 10'
V1	Right A-Pillar	60° 47'	67° 27'	6° 40'

Total 6° 50'

Explanations Pertinent to the Specific Measurements:

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DATA SHEET 2  
MONOCULAR OBSTRUCTION ANGLE FROM V1  
TEST 3

VEHICLE:

MANUFACTURER American Motors Corporation YEAR 1979  
 MODEL Concord BODY STYLE 4-Door Sedan  
 VIN A9A057H138532

LOCATION OF "V" POINT RELATIVE TO THE "R" POINT

	V1	V2
X	2.33	2.33
Y	-0.20	-0.20
Z	26.28	23.28

OBSTRUCTIONS: Zone IV

<u>Elevation</u>	<u>Obstruction</u>	<u>Left Angle</u>	<u>Right Angle</u>	<u>Obstruction Angle</u>
V1	Right B-Pillar	94° 48'	102° 08'	7° 20'
V1	Right C-Pillar	125° 37'	143° 08'	17° 31'

Total 24° 51'

Explanations Pertinent to the Specific Measurements:

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DATA SHEET 2  
MONOCULAR OBSTRUCTION ANGLE FROM V2  
TEST 3

VEHICLE:

MANUFACTURER American Motors Corporation YEAR 1979  
 MODEL Concord BODY STYLE 4-Door Sedan  
 VIN A9A057H138532

LOCATION OF "V" POINT RELATIVE TO THE "R" POINT

	<u>V<sub>1</sub></u>	<u>V<sub>2</sub></u>
X	2.33	2.33
Y	-0.20	-0.20
Z	26.28	23.28

OBSTRUCTIONS: Zone I

<u>Elevation</u>	<u>Obstruction</u>	<u>Left Angle</u>	<u>Right Angle</u>	<u>Obstruction Angle</u>
V2	Left A-Pillar	323° 49'	331° 57'*	8.08'

Total 8.08'

Explanations Pertinent to the Specific Measurements:

\*Reading taken at edge of sealer.

DATA SHEET 2  
MONOCULAR OBSTRUCTION ANGLE FROM V2  
TEST 3

**VEHICLE:**

MANUFACTURER American Motors Corporation YEAR 1979  
 MODEL Concord BODY STYLE 4-Door Sedan  
 VIN A9A057H138532

LOCATION OF "V" POINT RELATIVE TO THE "R" POINT

	V <sub>1</sub>	V <sub>2</sub>
X	2.33	2.33
Y	-0.20	-0.20
Z	26.28	23.28

OBSTRUCTIONS: Zone II

<u>Elevation</u>	<u>Obstruction</u>	<u>Left Angle</u>	<u>Right Angle</u>	<u>Obstruction Angle</u>
V2	Antenna	44° 32'	44° 42'	0° 10'
V2	Right A-Pillar	57° 07'	63° 22'	6° 15'

Total 6° 25'

Explanations Pertinent to the Specific Measurements:

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DATA SHEET 2  
MONOCULAR OBSTRUCTION ANGLE FROM V 2  
TEST 3

VEHICLE:

MANUFACTURER American Motors Corporation YEAR 1979  
 MODEL Concord BODY STYLE 4-Door Sedan  
 VIN A9A057H138532

LOCATION OF "V" POINT RELATIVE TO THE "R" POINT

	V <sub>1</sub>	V <sub>2</sub>
X	2.33	2.33
Y	-0.20	-0.20
Z	26.28	23.28

OBSTRUCTIONS: Zone IV

Elevation	Obstruction	Left Angle	Right Angle	Obstruction Angle
V2	Right B-Pillar	94° 08'	102° 04'	7° 56' *
V2	Right C-Pillar	126° 22'	144° 48'	18° 26'

Total 26° 22'

Explanations Pertinent to the Specific Measurements:

\*Reading taken at edge safety belt assembly.

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DATA SHEET 4  
BINOCULAR OBSTRUCTION ANGLES

VEHICLE:

TEST 3

MANUFACTURER	American Motors Corporation	YEAR	1979
MODEL	Concord	BODY STYLE	4-Door Sedan
VIN	A9A057H138532		

	Dimensions Relative to R		
	X	Y	Z
P <sub>1</sub>	0.28	-0.80	24.76
P <sub>2</sub>	1.28	1.85	24.76

Zone: I

Obstruction	Left A-Pillar
Initial Sight to Outboard E - Rear Side	314° 46'
Adjusted Sight to Outboard E - Rear Side	330° 00'
Inboard E - Front Side	335° 25'
Angle to Bench Mark	90° 00'
Obstruction Angle	5° 25'
Azimuth	

Zone: II

Obstruction	Right A-Pillar
Initial Sight to Outboard E - Rear Side	70° 10'
Adjusted Sight to Outboard E - Rear Side	30° 00'
Inboard E - Front Side	25° 50'
Angle to Bench Mark	270° 00'
Obstruction Angle	4° 10'
Azimuth	

Explanations Pertinent to the Specific Measurements:

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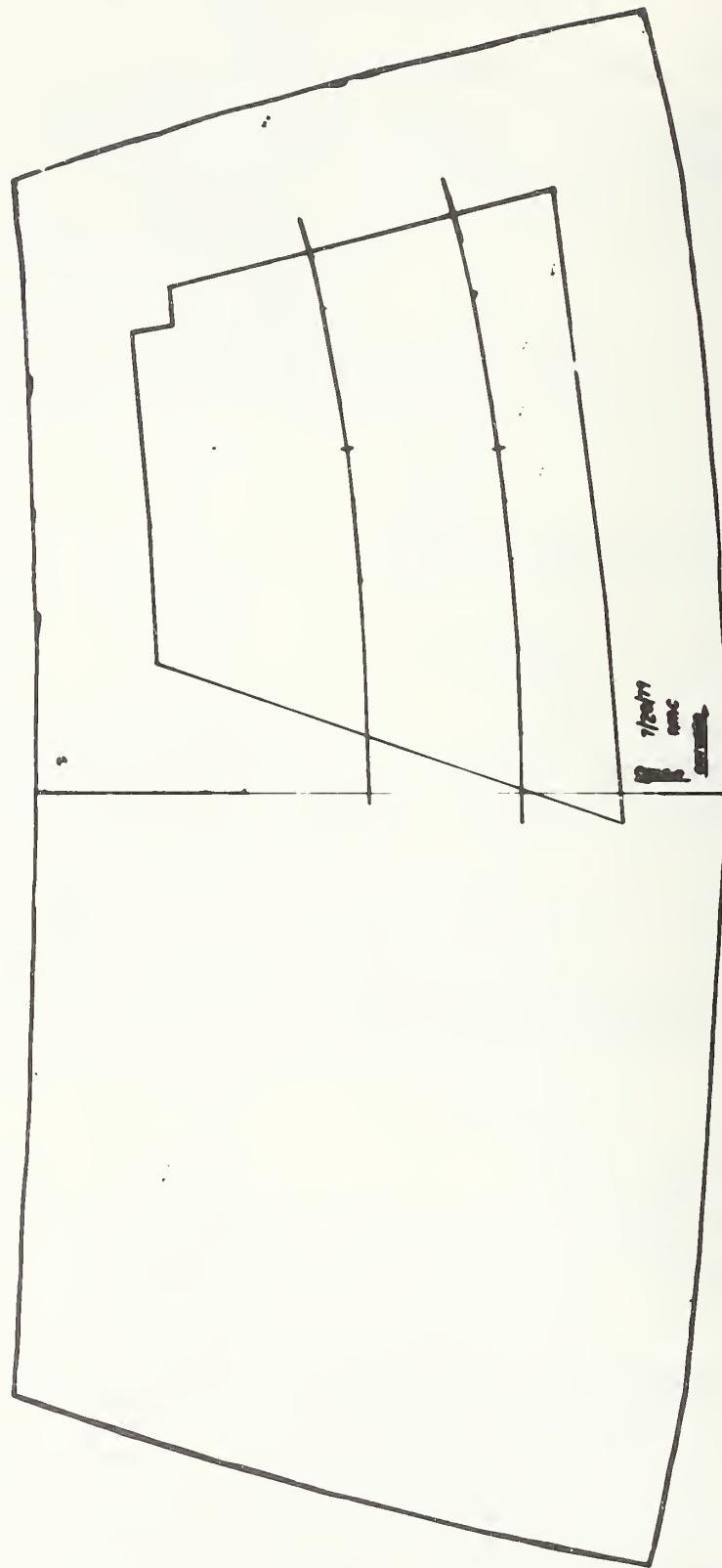


Figure B-19. AMC Concord Test No. 3. View Area A.

### Ambinocular Fields of View

The sketches on Page B-5 show the location of the P points relative to the R point. Angular measurements from approximate E points to the mirrors are shown for information only in Data Sheet 5 (see page B-44).

Measured data is compared with the requirements below.

	Left Outside Unit Mirror		Right Outside Unit Mirror		Interior Rearview Mirror	
	E7	E8	E5	E6	E5	E6
Test 3 Area (ft <sup>2</sup> )	12.2	10.9	17.9	18.5	29.7	27.0
Net Percent		58		70		86
Required by Docket No. 71- 3a Notice 4	75% of Target SL (Unit Mir- ror)		75% of Target SR (Unit Mir- ror)		75% of Target Q (Unit Mir- ror)	

NOTE: Mirrors were not necessarily positioned to view the maximum amount of target. Instead, to meet the goals of this program, they were positioned in a standard manner (see Appendix A) in order to evaluate repeatability in positioning the mirror.

Photographs of the views to the flat mirrors from the various eyepoints are included as Figures B-17 through B-25.

DATA SHEET 5  
AMBINOCULAR FIELD OF VIEW  
TEST 3

**VEHICLE:**

<b>MANUFACTURER</b>	American Motors Corporation	<b>YEAR</b>	1979
<b>MODEL</b>	Concord	<b>BODY STYLE</b>	4-Door Sedan
<b>VIN</b>	A9A057H138532		

	<b>Dimensions Relative to R-Point</b>		
	X	Y	Z
P <sub>3</sub>	5.73	-1.60	25.10
P <sub>4</sub>	5.73	+1.20	25.10

**Zone:** I\*

<b>Obstruction</b>	<b>Left Outside Mirror</b>
E <sub>8</sub> - Initial Sight to Vertical Midpoint - Left Side	303° 57'
E <sub>8</sub> - Adjusted Sight to Vertical Midpoint - Left Side	330° 00'
Angle to Bench Mark	90°
E <sub>7</sub> - Angle to Vertical Midpoint - Right Side	344° 03'
Azimuth	

**Zone:** II\*\*

<b>Obstruction</b>	<b>Interior Rearview Mirror</b>	<b>Right Outside Mirror</b>
E <sub>5</sub> - Initial Sight to Vertical Midpoint - Right Side	52° 23'	71° 35'
E <sub>5</sub> - Adjusted Sight to Vertical Midpoint - Right Side	30° 0'	30° 0'
Angle to Bench Mark	270°	270°
E <sub>6</sub> - Angle to Vertical Midpoint - Left Side	359° 30'	22° 54'
Azimuth		

**Explanations Pertinent to the Specific Measurements:**

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\*Use P<sub>4</sub> hole for E Plate.  
\*\*Use P<sub>3</sub> hole for E plate.



Figure B-20. AMC Concord Test No. 3 Left Flat Mirror From E8.



Figure B-21. AMC Concord Test No. 3 Left Flat Mirror From E7.



Figure B-22. AMC Concord Test No. 3 Interior Rearview Mirror From E5.



Figure B-23. AMC Concord Test No. 3 Interior Rearview Mirror From E6.



Figure B-24. AMC Concord Test No. 3 Right Flat Mirror From E6.



Figure B-25. AMC Concord Test No. 3 Right Flat Mirror From E5.



APPENDIX C

FORD ECONOLINE VAN

This appendix contains all the data for the three tests conducted on the Ford Econoline Van. The appendix is organized as follows.

<u>Page No.</u>	<u>Description</u>
C-3	Figures C-1, C-2, and C-3 are views of the test vehicles
C-4	Figure C-4 provides dimensions for Direct Field of View Reference Points
C-5	Figure C-5 provides dimensions for Rearview Mirror Measurement Reference Points
C-6	Vehicle Data Sheet; Test No. 1
C-7-C-14	Direct Field of View Data; Test No. 1
C-15-C-25	Rearview Mirror Data; Test No. 1
C-26	Vehicle Data Sheet; Test No. 2
C-27-C-34	Direct Field of View Data; Test No. 2
C-35-C-45	Rearview Mirror Data; Test No. 2
C-46	Vehicle Data Sheet; Test No. 3
C-47-C-54	Direct Field of View Data; Test No. 3
C-55-C-65	Rearview Mirror Data; Test No. 3



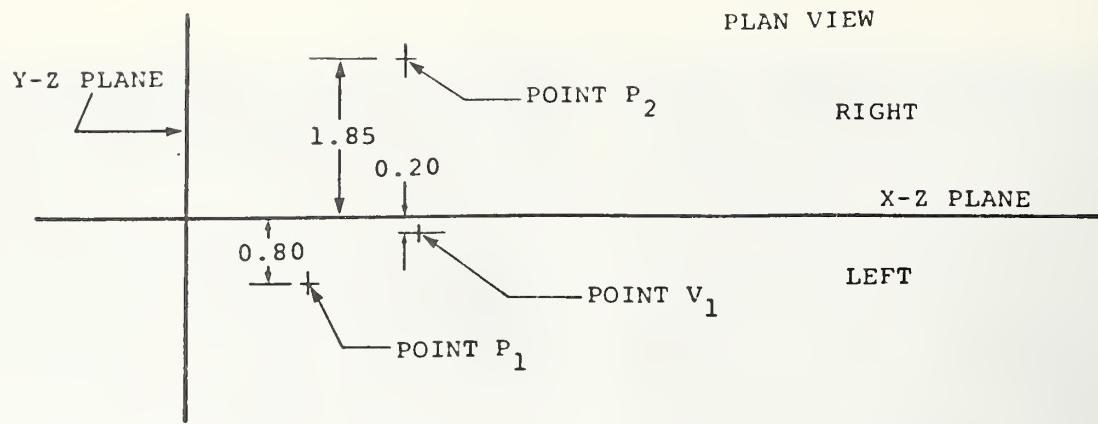
Figure C-1. Ford Econoline  
E-100 Left Front  
Quarter View.



Figure C-2. Ford Econoline  
E-100 Left Rear  
Quarter View.



Figure C-3. Ford Econoline E-100 Front Crossview Mirror.



## ELEVATION VIEW

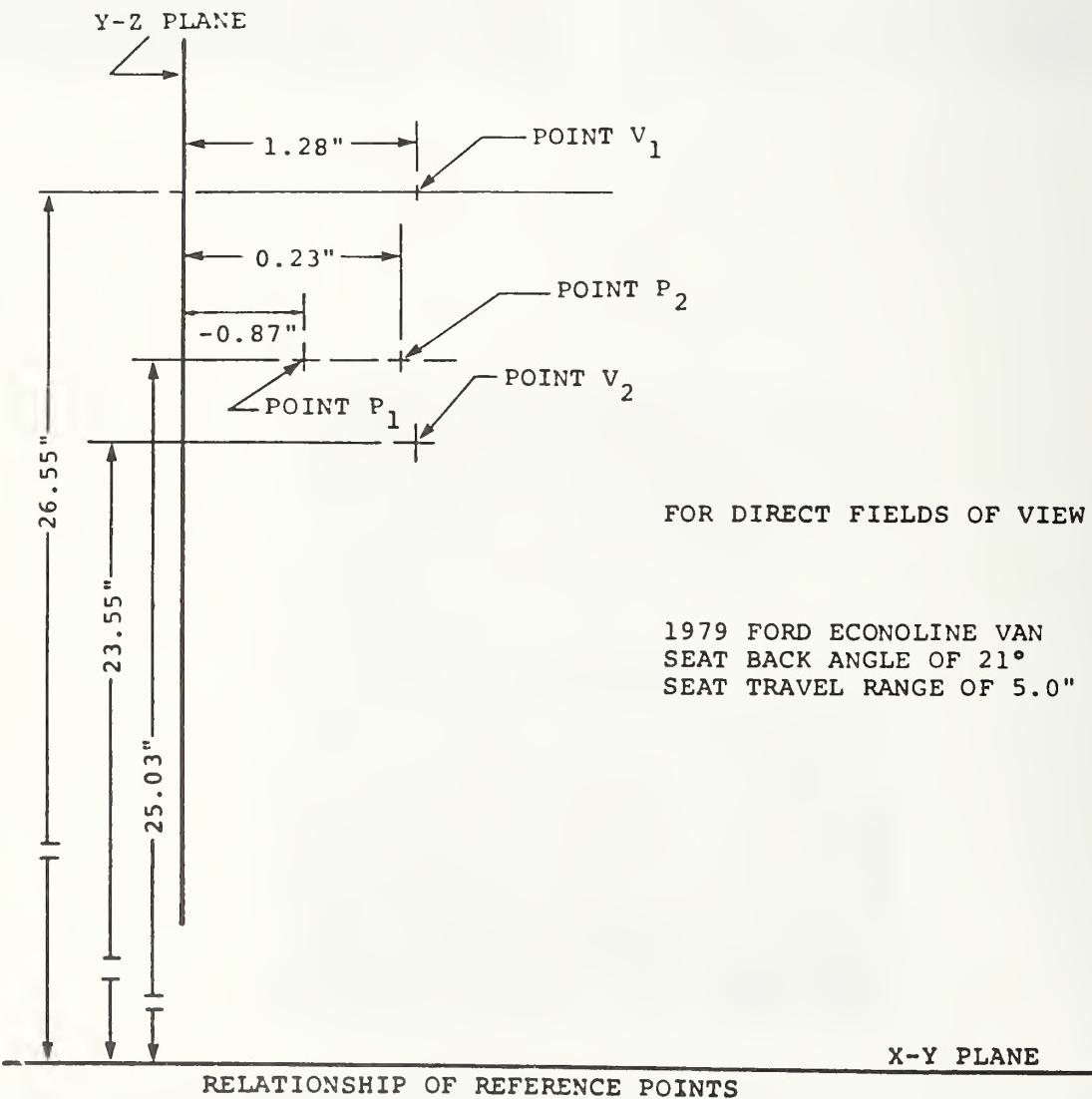


Figure C-4. Relationship of Reference Points for Direct Field of View Measurements.

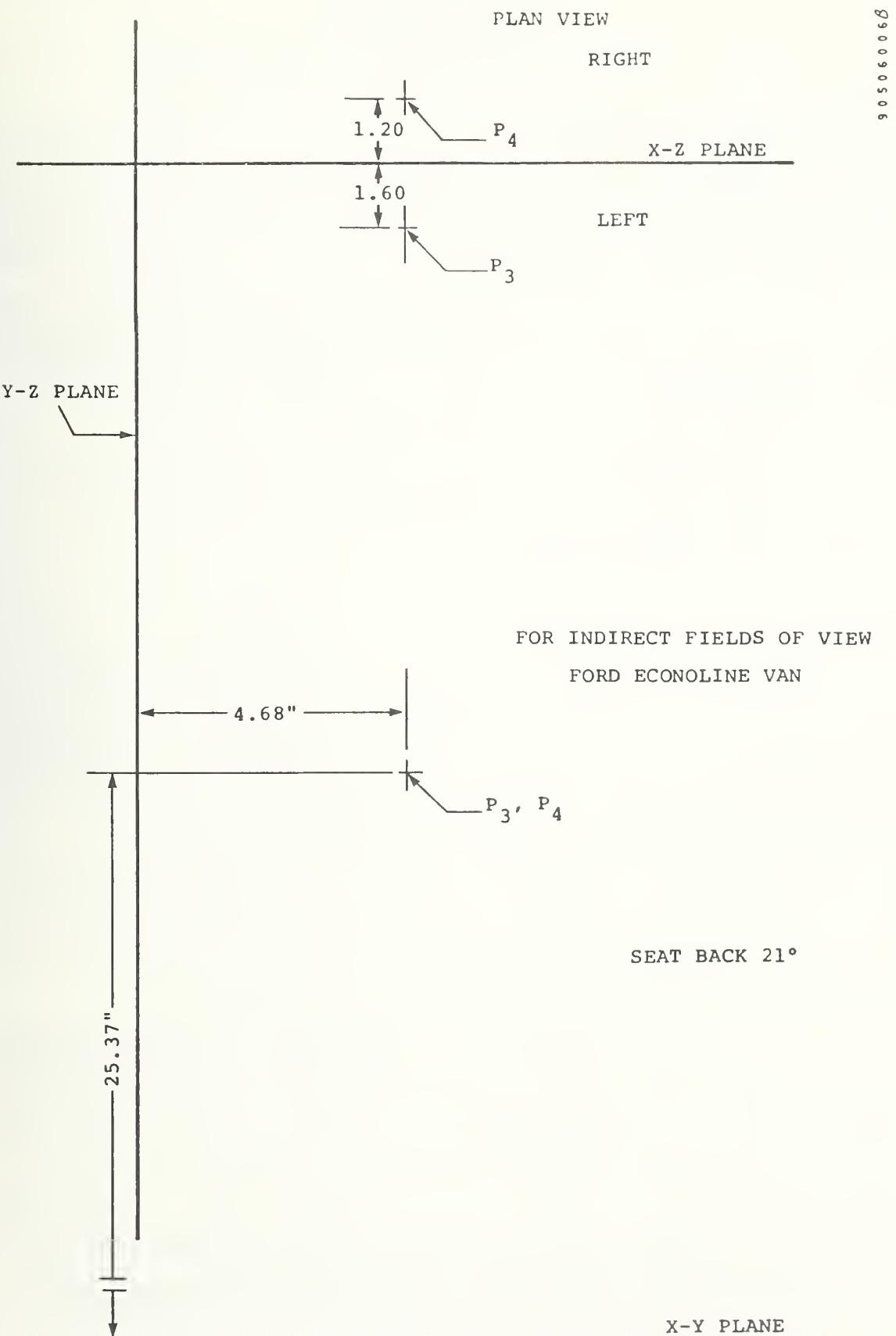


Figure C-5. Relationship of Reference Points for Rearview Mirror Measurements.

## DATA SHEET NO. 1

## VEHICLE DATA

## TEST 1

## VEHICLE:

MANUFACTURER Ford Motor Co. YEAR 1978  
 MODEL Econoline BODY STYLE Van  
 VIN EO5BHBA2743 ODOMETER 5843  
 BUILD DATE 1/78  
 SPECIAL OPTIONS \_\_\_\_\_

FRONT SEAT TYPE:	ACTUAL	Buckets
TILT STEERING WHEEL?	YES <u>      </u>	NO <u>X</u>
FRONT SEAT TRAVEL RANGE:	SPECIFIED	<u>5.0 in.</u>
FRONT SEAT BACK ANGLE:	SPECIFIED	<u>21.0°</u>

## MEASURING POINT CORRECTIONS

	X (in.)	Z (in.)
P From Table 2	<u>-0.88</u>	<u>--</u>
P From Table 3	<u>-1.39</u>	<u>+0.37</u>
Total P	<u>-2.27</u>	<u>+0.37</u>
V From Table 3	<u>-1.39</u>	<u>+0.37</u>

## MANUFACTURER'S REFERENCE POINTS FOR R POINT

For X <u>46.50</u>	to Y-Z Plane
For Y <u>-19.75</u>	to X-Z Plane
For Z <u>24.80</u>	to X-Y Plane

## MANUFACTURER'S DIMENSIONS FOR VEHICLE ATTITUDE

	From Zero X-Plane	From Zero Y-Plane	Height Above Ground (curb wgt)
Front Fiducial Station	32.00 (rear of notch)	32.80	12.93 (top of notch)
Rear of Sliding Cargo Door	98.00	36.06	18.75 (top of sill)
"R" Point	46.50	-19.75	39.84

DATA SHEET 2A  
MONOCULAR OBSTRUCTION ANGLE FROM V1  
TEST 1

VEHICLE:

MANUFACTURER Ford Motor Co. YEAR 1978  
 MODEL Econoline BODY STYLE Van  
 VIN EO5BHBA2743

LOCATION OF "V" POINT RELATIVE TO THE "R" POINT

	V <sub>1</sub>	V <sub>2</sub>
X	1.28	1.28
Y	-0.20	-0.20
Z	26.55	23.55

OBSTRUCTIONS: Zone I

Elevation	Obstruction	Left Angle	Right Angle	Obstruction Angle
V1	Left A-Pillar	324° 48'	335° 07'	10° 19'

Total 10° 19'

Explanations Pertinent to the Specific Measurements:

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DATA SHEET 2A  
MONOCULAR OBSTRUCTION ANGLE FROM V1  
TEST 1

VEHICLE:

MANUFACTURER Ford Motor Co. YEAR 1978  
 MODEL Econoline BODY STYLE Van  
 VIN EO5BHBA2743

LOCATION OF "V" POINT RELATIVE TO THE "R" POINT

	V <sub>1</sub>	V <sub>2</sub>
X	1.28	1.28
Y	-0.20	-0.20
Z	26.55	23.55

OBSTRUCTIONS: Zone II

<u>Elevation</u>	<u>Obstruction</u>	<u>Left Angle</u>	<u>Right Angle</u>	<u>Obstruction Angle</u>
V1	Right A-Pillar	63° 51'	70° 20'	6° 29'

Total 6° 29'

Explanations Pertinent to the Specific Measurements:

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DATA SHEET 2A  
MONOCULAR OBSTRUCTION ANGLE FROM V1  
TEST 1

VEHICLE:

MANUFACTURER Ford Motor Co. YEAR 1978  
 MODEL Econoline BODY STYLE Van  
 VIN EO5BHBA2743

LOCATION OF "V" POINT RELATIVE TO THE "R" POINT

	V <sub>1</sub>	V <sub>2</sub>
X	1.28	1.28
Y	-0.20	-0.20
Z	26.55	23.55

OBSTRUCTIONS: Zone IV

<u>Elevation</u>	<u>Obstruction</u>	<u>Left Angle</u>	<u>Right Angle</u>	<u>Obstruction Angle</u>
V1	Right B-Pillar	91° 11'	99° 46'	8° 35'
V1	Right C-Pillar	133° 59'	137° 56'	3° 57'
V1	Right Rear Corner Pillar	155° 19'	160° 32'	5° 13'
V1	Center Pillar of Rear Doors	169° 14'	172° 37'	3° 23'
<u>Total</u>				21° 08'

Explanations Pertinent to the Specific Measurements:

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DATA SHEET 2B  
MONOCULAR OBSTRUCTION ANGLE FROM V2  
TEST 1

VEHICLE:

MANUFACTURER Ford Motor Co. YEAR 1978

MODEL Econoline BODY STYLE Van

VIN EO5BHBA2743

LOCATION OF "V" POINT RELATIVE TO THE "R" POINT

	<u>V<sub>1</sub></u>	<u>V<sub>2</sub></u>
X	1.28	1.28
Y	-0.20	-0.20
Z	26.55	23.55

OBSTRUCTIONS: Zone I

<u>Elevation</u>	<u>Obstruction</u>	<u>Left Angle</u>	<u>Right Angle</u>	<u>Obstruction Angle</u>
V2	Left Wing Window Frame	323° 26'	326° 15'	2° 49'
V2	Left A-Pillar	328° 18'	335° 39'	7° 21'

Total 10° 10'

Explanations Pertinent to the Specific Measurements:

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DATA SHEET 2B  
MONOCULAR OBSTRUCTION ANGLE FROM V2  
TEST 1

**VEHICLE:**

MANUFACTURER Ford Motor Co. YEAR 1978

MODEL Econoline BODY STYLE Van

VIN EO5BHBA2743

**LOCATION OF "V" POINT RELATIVE TO THE "R" POINT**

	<u>V<sub>1</sub></u>	<u>V<sub>2</sub></u>
X	1.28	1.28
Y	-0.20	-0.20
Z	26.55	23.55

**OBSTRUCTIONS:** Zone II

<u>Elevation</u>	<u>Obstruction</u>	<u>Left Angle</u>	<u>Right Angle</u>	<u>Obstruction Angle</u>
V2	Antenna on Right Front Fender*	51° 40'	51° 54'	0° 14'
V2	Right A-Pillar	62° 13'	67° 20'	5° 07'
V2	Right Wing Window Frame	69° 17'	70° 29'	1° 12'

Total 6° 33'

**Explanations Pertinent to the Specific Measurements:**

\*Completely collapsed.

DATA SHEET 2B  
MONOCULAR OBSTRUCTION ANGLE FROM V2  
TEST 1

VEHICLE:

MANUFACTURER Ford Motor Co. YEAR 1978

MODEL Econoline BODY STYLE Van

VIN E05BHBA2743

LOCATION OF "V" POINT RELATIVE TO THE "R" POINT

	<u>V<sub>1</sub></u>	<u>V<sub>2</sub></u>
X	1.28	1.28
Y	-0.20	-0.20
Z	26.55	23.55

OBSTRUCTIONS: Zone IV

<u>Elevation</u>	<u>Obstruction</u>	<u>Left Angle</u>	<u>Right Angle</u>	<u>Obstruction Angle</u>
V2	Right B-Pillar	91° 01'	99° 45'	8° 44'
V2	Right C-Pillar	133° 37'	137° 32'	3° 55'
V2	Right Rear Corner Pillar	155° 11'	160° 42'	5° 31'
V2	Center Pillar of Rear Doors	169° 20'	172° 42'	3° 22'

Total 21° 32'

Explanations Pertinent to the Specific Measurements:

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DATA SHEET 4  
BINOCULAR OBSTRUCTION ANGLES  
TEST 1

VEHICLE:

MANUFACTURER Ford Motor Co. YEAR 1978  
 MODEL Econoline BODY STYLE Van  
 VIN EO5BHBA2743

	Dimensions Relative to R		
	X	Y	Z
P <sub>1</sub>	-0.87	-0.80	25.03
P <sub>2</sub>	0.23	+1.85	25.03

Zone: I

Obstruction	Left A-Pillar		
Initial Sight to Outboard E - Rear Side	323° 01'		
Adjusted Sight to Outboard E - Rear Side	330° 00'		
Inboard E - Front Side	333° 24'		
Angle to Bench Mark			
Obstruction Angle	3° 24'		
Azimuth			

Zone: II

Obstruction	Right A-Pillar		
Initial Sight to Outboard E - Rear Side	71° 40'		
Adjusted Sight to Outboard E - Rear Side	30° 00'		
Inboard E - Front Side	26° 51'		
Angle to Bench Mark			
Obstruction Angle	3° 09'		
Azimuth			

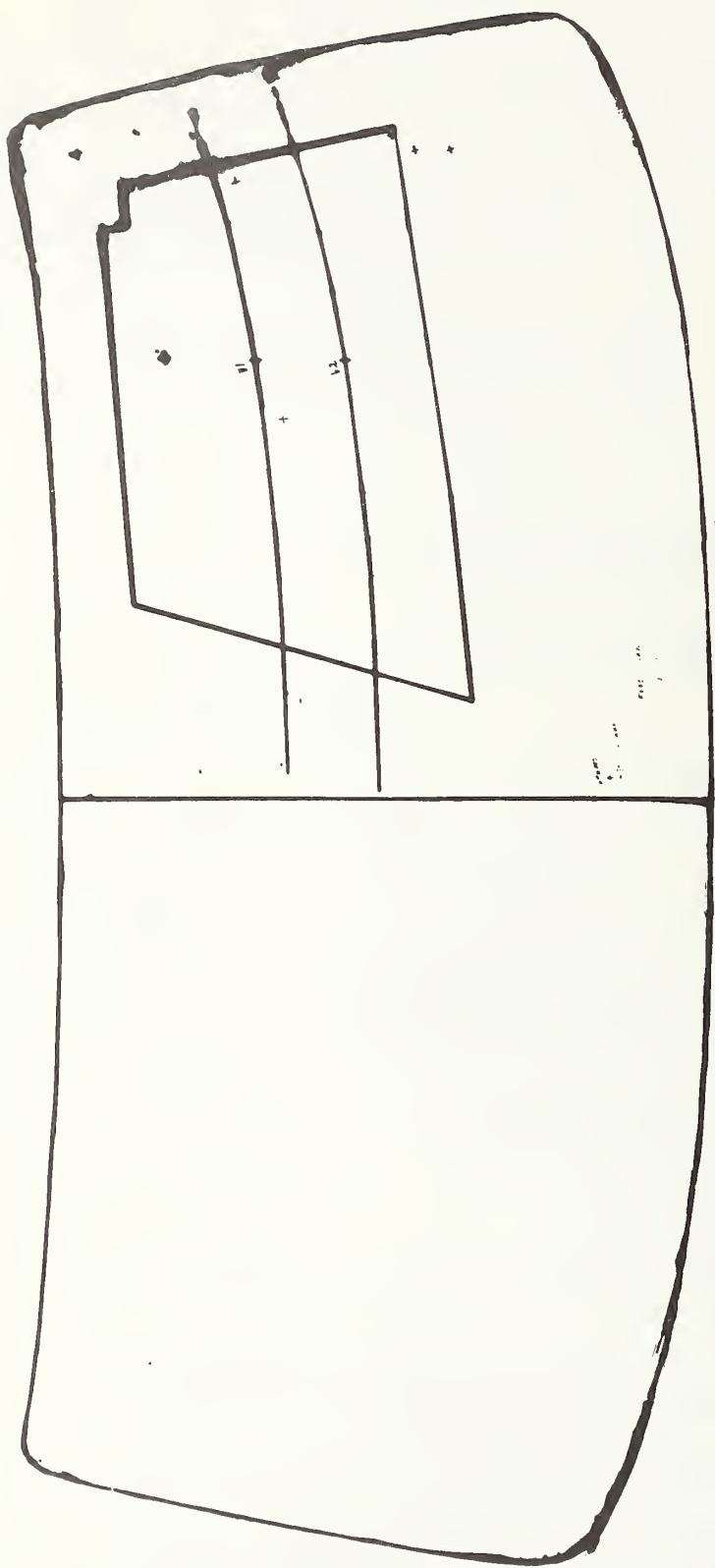
Explanations Pertinent to the Specific Measurements:

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C-14

Figure C-6. Ford Econoline E-100 Test No. 1. View Area A.

Ambinocular Fields of View

The sketches on Page C-5 show the location of the P points relative to the R point. Angular measurements from approximate E points to the mirrors are shown for information only in Data Sheet 5 (see pages C-17 and C-18).

Measured data is compared with the requirements below.

Tested as a Passenger Car

	Left Outside Unit Mirror		Right Outside Unit Mirror		Interior Rearview Mirror	
	E7	E8	E5	E6	E5	E6
Test 1 Area (ft <sup>2</sup> )	21.0	20.8	8.7	9.4	8.9	10.2
Net Percent	87		39		34	
Required by Doc- ket No. 71.3a, Notice 4 (Para. 5.1.2.1)	75% of Target SL (Unit Mir- ror)		75% of Target SR (Unit Mir- ror)		60% of Target Q (Unit Mir- ror)	

Tested as a Truck

	Left Out- side Unit Mirror		Right Out- side Unit Mirror		Right Out- side Convex Mirror		Front Crossview Mirror	
	E7	E8	E5	E6	E5	E6	E7	E8
Area (ft <sup>2</sup> )	27.0	22.2	15.2	17.2	270	270	15.2	15.0
Net Percent	100		80		45		76	
Required by Doc- ket No. 71.3a, Notice 4 (Para. 5.1.2.2)	95% of Target XL (Unit Mir- ror)		65% of Target XR (Unit Mir- ror)		95% of Tar- get YR		85% of Ground Target (per 5.1.2.3.1)	

NOTE: Mirrors were not necessarily positioned to view the maximum amount of target. Instead, to meet the goals of this program, they were positioned in a standard manner (see Appendix A) in order to evaluate repeatability in positioning the mirror.

Photographs of the views to the flat mirrors from the various eyepoints are included as Figures C-7 through C-20.

DATA SHEET 5  
AMBINOCULAR FIELD OF VIEW  
TEST 1

(As passenger car  
targets SL, Q, SR)

**VEHICLE:**

MANUFACTURER	Ford Motor Co.	YEAR	1978
MODEL	Econoline	BODY STYLE	Van
VIN	EO5BHBA2743		

	Dimensions Relative to R-Point		
	X	Y	Z
P <sub>3</sub>	4.68	-1.60	25.37
P <sub>4</sub>	4.68	+1.20	25.37

Zone: I\*

Obstruction	Left Outside Mirror	
E <sub>8</sub> - Initial Sight to Vertical Midpoint - Left Side	302° 26'	
E <sub>8</sub> - Adjusted Sight to Vertical Midpoint - Left Side	330° 00'	
Angle to Bench Mark	90°	
E <sub>7</sub> - Angle to Vertical Midpoint - Right Side	347° 22'	
Azimuth		

Zone: II\*\*

Obstruction	Interior Rearview Mirror	Right Outside Mirror
E <sub>5</sub> - Initial Sight to Vertical Midpoint - Right Side	50° 55'	76° 50'
E <sub>5</sub> - Adjusted Sight to Vertical Midpoint - Right Side	30° 0'	30° 0'
Angle to Bench Mark	270°	270°
E <sub>6</sub> - Angle to Vertical Midpoint - Left Side	6° 39'	22° 21'
Azimuth		

Explanations Pertinent to the Specific Measurements:

\*Use P<sub>4</sub> hole for E Plate.  
\*\*Use P<sub>3</sub> hole for E plate.

DATA SHEET 5  
AMBINOCULAR FIELD OF VIEW

(As a truck targets  
XL, XR)

TEST 1

VEHICLE:

MANUFACTURER Ford Motor Company YEAR 1978  
MODEL Econoline BODY STYLE Van  
VIN E05BHBA2743

	Dimensions Relative to R-Point		
	X	Y	Z
P <sub>3</sub>	4.68	-1.60	25.37
P <sub>4</sub>	4.68	+1.20	25.37
Zone: <u>I*</u>	Left Outside Mirror	Front Cross View Mirror	
Obstruction			
E <sub>8</sub> - Initial Sight to Vertical Midpoint - Left Side	302° 27'	337° 48'	
E <sub>8</sub> - Adjusted Sight to Vertical Midpoint - Left Side	330° 00'		
Angle to Bench Mark	90°	90°	
E <sub>7</sub> - Angle to Vertical Midpoint - Right Side	347° 45'	344° 25'	
Azimuth			
Zone: <u>II**</u>	Right Outside Unit Mirror	Right Outside Convex Mirror	
Obstruction			
E <sub>5</sub> - Initial Sight to Vertical Midpoint - Right Side	76° 56'	77° 37'	
E <sub>5</sub> - Adjusted Sight to Vertical Midpoint - Right Side	30° 0'	30° 0'	
Angle to Bench Mark	270°	270° 00'	
E <sub>6</sub> - Angle to Vertical Midpoint - Left Side	22° 11'*	25° 00''**	
Azimuth			

Explanations Pertinent to the Specific Measurements:

\* Partially blocked by wing window frame, reading is an estimate.

\*\* Blocked by window sill on right door, reading is an estimate.

\*Use P<sub>4</sub> hole for E Plate.

\*\*Use P<sub>3</sub> hole for E plate.



Figure C-7. Ford Econoline E-100 Test No. 1 (as Passenger Car) Left Flat Mirror From E8.



Figure C-8. Ford Econoline E-100 Test No. 1 (as Passenger Car) Left Flat Mirror From E7.



Figure C-9. Ford Econoline E-100 Test No. 1 Interior Rearview Mirror From E5.



Figure C-10. Ford Econoline E-100 Test No. 1 Interior Rearview Mirror From E6.



Figure C-11. Ford Econoline E-100 Test No. 1 (as Passenger Car) Right Flat Mirror From E6.



Figure C-12. Ford Econoline E-100 Test No. 1 (as Passenger Car) Right Flat Mirror From E5.



Figure C-13. Ford Econoline E-100 Test No. 1 (as a Truck)  
Left Flat Mirror From E8.



Figure C-14. Ford Econoline E-100 Test No. 1 (as a Truck)  
Left Flat Mirror From E7.



Figure C-15. Ford Econoline E-100 Test No. 1 (as a Truck)  
Right Flat Mirror From E6.



Figure C-16. Ford Econoline E-100 Test No. 1 (as a Truck)  
Right Flat Mirror From E5.



Figure C-17. Ford Econoline E-100 Test No. 1 (as a Truck)  
Right Convex Mirror From E6.



Figure C-18. Ford Econoline E-100 Test No. 1 (as a Truck)  
Right Convex Mirror From E5.



Figure C-19. Ford Econoline E-100 Test No. 1 Front Crossview Mirror From E7 ( $15.2 \text{ ft}^2$ ).



Figure C-20. Ford Econoline E-100 Test No. 1 Front Crossview Mirror From E8 ( $15.0 \text{ ft}^2$ ).

## DATA SHEET NO. 1

## VEHICLE DATA

6/15 - 6/22/79

## TEST 2

## VEHICLE:

MANUFACTURER Ford Motor Company YEAR 1978  
 MODEL Econoline BODY STYLE Van  
 VIN EO5BHBA2743 ODOMETER 5848  
 BUILD DATE 01/78  
 SPECIAL OPTIONS \_\_\_\_\_

FRONT SEAT TYPE: Actual Buckets

TILT STEERING WHEEL? YES        NO X

FRONT SEAT TRAVEL RANGE: SPECIFIED 5.0 in.

FRONT SEAT BACK ANGLE: SPECIFIED 21.0°

## MEASURING POINT CORRECTIONS

	X (in.)	Z (in.)
P From Table 2	-0.88	-
P From Table 3	-1.39	+0.37
Total P	-2.27	+0.37
V From Table 3	-1.39	+0.37

## MANUFACTURER'S REFERENCE POINTS FOR R POINT

For X	46.50	to Y-Z Plane
For Y	-19.75	to X-Z Plane
For Z	24.80	to X-Y Plane

## MANUFACTURER'S DIMENSIONS FOR VEHICLE ATTITUDE

	From Zero X-Plane	From Zero Y-Plane	Height Above Ground (curb wgt)
Front Fiducial Station	32.00 (rear of notch)	32.80	12.93 (top of notch)
Rear of Sliding Cargo Door	98.00	36.06	18.75 (top of sill)
"R". Point	46.50	-19.75	39.84

DATA SHEET 2A  
MONOCULAR OBSTRUCTION ANGLE FROM V<sub>1</sub>  
TEST 2

VEHICLE:

MANUFACTURER Ford Motor Company YEAR 1978  
 MODEL Econoline BODY STYLE Van  
 VIN EO5BHBA2743

LOCATION OF "V" POINT RELATIVE TO THE "R" POINT

	V <sub>1</sub>	V <sub>2</sub>
X	1.28	1.28
Y	-0.20	-0.20
Z	26.55	23.55

OBSTRUCTIONS: Zone I

<u>Elevation</u>	<u>Obstruction</u>	<u>Left Angle</u>	<u>Right Angle</u>	<u>Obstruction Angle</u>
V <sub>1</sub>	Left wing window frame & A-pillar	325° 30'	335° 33'	10° 03'

Total 10° 03'

Explanations Pertinent to the Specific Measurements:

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DATA SHEET 2A  
MONOCULAR OBSTRUCTION ANGLE FROM V<sub>1</sub>  
TEST 2

VEHICLE:

MANUFACTURER Ford Motor Company YEAR 1978  
 MODEL Econoline BODY STYLE Van  
 VIN EO5BHBA2743

LOCATION OF "V" POINT RELATIVE TO THE "R" POINT

	V <sub>1</sub>	V <sub>2</sub>
X	1.28	1.28
Y	-0.20	-0.20
Z	26.55	23.55

OBSTRUCTIONS: Zone II

<u>Elevation</u>	<u>Obstruction</u>	<u>Left Angle</u>	<u>Right Angle</u>	<u>Obstruction Angle</u>
V <sub>1</sub>	Right A-pillar	63° 06'	68° 20'	5° 14'
V <sub>1</sub>	Right wing window frame	68° 24'	69° 38'	1° 14'

Total 6° 28'

Explanations Pertinent to the Specific Measurements:

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DATA SHEET 2 A  
MONOCULAR OBSTRUCTION ANGLE FROM V<sub>1</sub>  
TEST 2

VEHICLE:

MANUFACTURER Ford Motor Company YEAR 1978  
 MODEL Econoline BODY STYLE Van  
 VIN EO5BHBA2743

LOCATION OF "V" POINT RELATIVE TO THE "R" POINT

	V <sub>1</sub>	V <sub>2</sub>
X	1.28	1.28
Y	-0.20	-0.20
Z	26.55	23.55

OBSTRUCTIONS: Zone IV

Elevation	Obstruction	Left Angle	Right Angle	Obstruction Angle
V <sub>1</sub>	Right B-pillar	90° 25'	99° 02'	8° 37'
V <sub>1</sub>	Right C-pillar	133° 31'	137° 29'	3° 58'
V <sub>1</sub>	Right rear corner pillar	155° 03'	160° 20'	5° 17'
V <sub>1</sub>	Center pillar of Rear Doors	169° 04'	172° 26'	3° 22'

Total 21° 14'

Explanations Pertinent to the Specific Measurements:

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DATA SHEET 2B  
MONOCULAR OBSTRUCTION ANGLE FROM V<sub>2</sub>  
TEST 2

VEHICLE:

MANUFACTURER Ford Motor Company YEAR 1978  
 MODEL Econoline BODY STYLE Van  
 VIN EO5BHBA2743

LOCATION OF "V" POINT RELATIVE TO THE "R" POINT

	V <sub>1</sub>	V <sub>2</sub>
X	1.28	1.28
Y	-0.20	-0.20
Z	26.55	23.55

OBSTRUCTIONS: Zone I

<u>Elevation</u>	<u>Obstruction</u>	<u>Left Angle</u>	<u>Right Angle</u>	<u>Obstruction Angle</u>
V <sub>2</sub>	Left wing window frame	324° 08'	326° 54'	2° 46'
V <sub>2</sub>	Left A-pillar	328° 57'	336° 04'	7° 07'

Total 9° 53'

Explanations Pertinent to the Specific Measurements:

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DATA SHEET 2A  
MONOCULAR OBSTRUCTION ANGLE FROM V<sub>2</sub>  
TEST 2

VEHICLE:

MANUFACTURER Ford Motor Company YEAR 1978  
 MODEL Econoline BODY STYLE Van  
 VIN EO5BHBA2743

LOCATION OF "V" POINT RELATIVE TO THE "R" POINT

	V <sub>1</sub>	V <sub>2</sub>
X	1.28	1.28
Y	-0.20	-0.20
Z	26.55	23.55

OBSTRUCTIONS: Zone II

<u>Elevation</u>	<u>Obstruction</u>	<u>Left Angle</u>	<u>Right Angle</u>	<u>Obstruction Angle</u>
V <sub>2</sub>	Antenna on right front fender*	51° 13'	51° 23'	0° 10'
V <sub>2</sub>	Right A-pillar	61° 32'	66° 35'	5° 03'
V <sub>2</sub>	Right wing window frame	68° 37'	69° 49'	1° 12'

Total 6° 25'

Explanations Pertinent to the Specific Measurements:

\*Completely collapsed.

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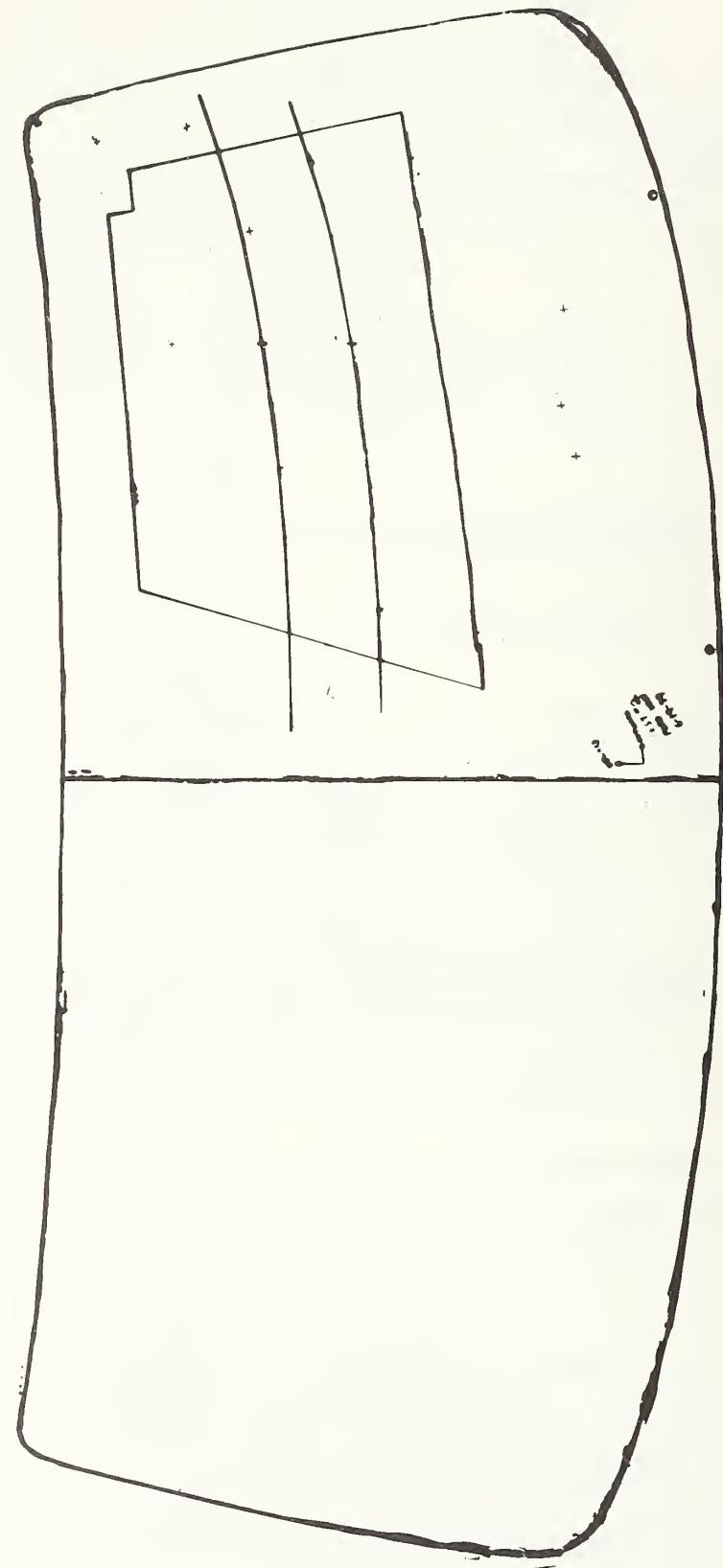


Figure C-21. Ford Econoline E-100 Test No. 2. View Area A.

### Ambinocular Fields of View

The sketches on Page C-5 show the location of the P points relative to the R point. Angular measurements from approximate E points to the mirrors are shown for information only in Data Sheet 5 (see pages C-37 and C-38).

Measured data is compared with the requirements below.

#### Tested as a Passenger Car

	Left Outside Unit Mirror		Right Outside Unit Mirror		Interior Rearview Mirror	
	E7	E8	E5	E6	E5	E6
Test 1 Area (ft <sup>2</sup> )	20.6	19.7	8.7	9.3	8.7	9.4
Net Percent	86		41		33	
Required by Doc- ket No. 71.3a, Notice 4 (Para. 5.1.2.1)	75% of Target SL (Unit Mir- ror)		75% of Target SR (Unit Mir- ror)		60% of Target Q (Unit Mir- ror)	

#### Tested as a Truck

	Left Out- side Unit Mirror		Right Out- side Unit Mirror		Right Out- side Convex Mirror		Front Crossview Mirror	
	E7	E8	E5	E6	E5	E6	E7	E8
Area (ft <sup>2</sup> )	27.0	20.9	15.1	17.2	300	300	15.0	14.2
Net Percent	100		80		50		75	
Required by Doc- ket No. 71.3a, Notice 4 (Para. 5.1.2.2)	95% of Target XL (Unit Mir- ror)		65% of Target XR (Unit Mir- ror)		95% of Tar- get YR		85% of Ground Target (per 5.1.2.3)	

NOTE: Mirrors were not necessarily positioned to view the maximum amount of target. Instead, to meet the goals of this program, they were positioned in a standard manner (see Appendix A) in order to evaluate repeatability in positioning the mirror.

Photographs of the views to the flat mirrors from the various eyepoints are included as Figures C-22 through C-35.

## DATA SHEET 5

(As a passenger car)

## AMBINOCULAR FIELD OF VIEW

## TEST 2

## VEHICLE:

MANUFACTURER Ford Motor Company YEAR 1978  
 MODEL Econoline BODY STYLE Van  
 VIN EO5BHBA2743

## Dimensions Relative to R-Point

	X	Y	Z
<u>P<sub>3</sub></u>	4.68	-1.60	25.37
<u>P<sub>4</sub></u>	4.68	+1.20	25.37

Zone: I\*

Obstruction	Left Outside Mirror	
E <sub>8</sub> - Initial Sight to Vertical Midpoint - Left Side	302° 31'	
E <sub>8</sub> - Adjusted Sight to Vertical Midpoint - Left Side	330° 00'	
Angle to Bench Mark	90°	
E <sub>7</sub> - Angle to Vertical Midpoint - Right Side	347° 25'	
Azimuth		

Zone: II\*\*

Obstruction	Interior Rear View Mirror	Right Outside Mirror
E <sub>5</sub> - Initial Sight to Vertical Midpoint - Right Side	50° 33'	76° 34'
E <sub>5</sub> - Adjusted Sight to Vertical Midpoint - Right Side	30° 0'	30° 0'
Angle to Bench Mark	270°	270°
E <sub>6</sub> - Angle to Vertical Midpoint - Left Side	6° 46'	22° 21'
Azimuth		

Explanations Pertinent to the Specific Measurements:

\*Use P<sub>4</sub> hole for E Plate.\*\*Use P<sub>3</sub> hole for E plate.

## DATA SHEET 5

(As a truck)

## AMBINOCULAR FIELD OF VIEW

## TEST 2

## VEHICLE:

MANUFACTURER Ford Motor Co. YEAR 1978  
 MODEL Econoline BODY STYLE Van  
 VIN EO5BHBA2743

## Dimensions Relative to R-Point

	X	Y	Z
<u>P<sub>3</sub></u>	4.68	-1.60	25.37
<u>P<sub>4</sub></u>	4.68	+1.20	25.37

Zone: I\*

Obstruction	Left Outside Unit Mirror	Front Crossview Mirror
E <sub>8</sub> - Initial Sight to Vertical Midpoint - Left Side	302° 22'	337° 56'
E <sub>8</sub> - Adjusted Sight to Vertical Midpoint - Left Side	330° 00'	
Angle to Bench Mark	90°	270°
E <sub>7</sub> - Angle to Vertical Midpoint - Right Side	347° 53'	344° 12'
Azimuth		

Zone: II\*\*

Obstruction	Right Outside Unit Mirror	Right Outside Convex Mirror
E <sub>5</sub> - Initial Sight to Vertical Midpoint - Right Side	76° 42'	77° 29'
E <sub>5</sub> - Adjusted Sight to Vertical Midpoint - Right Side	30° 00'	30° 0'
Angle to Bench Mark	270°	270°
E <sub>6</sub> - Angle to Vertical Midpoint - Left Side	*22° 08'	24° 55'
Azimuth		

## Explanations Pertinent to the Specific Measurements:

\*Blocked by wing window frame, estimated reading.\*Use P<sub>4</sub> hole for E Plate.\*\*Use P<sub>3</sub> hole for E plate.



Figure C-22. Ford Econoline E-100 Test No. 2 (as a Passenger Car) Left Flat Mirror From E8.



Figure C-23. Ford Econoline E-100 Test No. 2 (as a Passenger Car) Left Flat Mirror From E7.



Figure C-24. Ford Econoline E-100 Test No. 2 Interior Rearview Mirror From E5.



Figure C-25. Ford Econoline E-100 Test No. 2 Interior Rearview Mirror From E6.



Figure C-22. Ford Econoline E-100 Test No. 2 (as a Passenger Car) Left Flat Mirror From E8.



Figure C-23. Ford Econoline E-100 Test No. 2 (as a Passenger Car) Left Flat Mirror From E7.



Figure C-24. Ford Econoline E-100 Test No. 2 Interior Rearview Mirror From E5.



Figure C-25. Ford Econoline E-100 Test No. 2 Interior Rearview Mirror From E6.



Figure C-26. Ford Econoline E-100 Test No. 2 (as a Passenger Car) Right Flat Mirror From E6.



Figure C-27. Ford Econoline E-100 Test No. 2 (as a Passenger Car) Right Flat Mirror From E5.



Figure C-28. Ford Econoline E-100 Test No. 2 (as a Truck)  
Left Flat Mirror From E8.



Figure C-29. Ford Econoline E-100 Test No. 2 (as a Truck)  
Left Flat Mirror From E7.



Figure C-30. Ford Econoline E-100 Test No. 2 (as a Truck)  
Right Flat Mirror From E6.



Figure C-31. Ford Econoline E-100 Test No. 2 (as a Truck)  
Right Flat Mirror From E5.



Figure C-32. Ford Econoline E-100 Test No. 2 (as a Truck)  
Right Convex Mirror From E6.



Figure C-33. Ford Econoline E-100 Test No. 2 (as a Truck)  
Right Convex Mirror From E5.



Figure C-34. Ford Econoline E-100 Test No. 2 Front Crossview Mirror From E7.



Figure C-35. Ford Econoline E-100 Test No. 2 Front Crossview Mirror From E8.

## DATA SHEET NO. 1

## VEHICLE DATA

August 2, 1979

## TEST 3

## VEHICLE:

MANUFACTURER Ford Motor Company YEAR 1978  
 MODEL Econoline BODY STYLE Van  
 VIN EO5BHBA2743 ODOMETER >5848  
 BUILD DATE 01-78  
 SPECIAL OPTIONS \_\_\_\_\_

FRONT SEAT TYPE: ACTUAL BucketsTILT STEERING WHEEL? YES        NO XFRONT SEAT TRAVEL RANGE: SPECIFIED 5.0 in.FRONT SEAT BACK ANGLE: SPECIFIED 21.0°

## MEASURING POINT CORRECTIONS

	X (in.)	Z (in.)
P From Table 2	-0.88	-
P From Table 3	-1.39	+0.37
Total P	-2.27	+0.37
V From Table 3	-1.39	+0.37

## MANUFACTURER'S REFERENCE POINTS FOR R POINT

For X 46.50 to Y-Z Plane \_\_\_\_\_  
 For Y -19.75 to X-Z Plane \_\_\_\_\_  
 For Z 24.80 to X-Y Plane \_\_\_\_\_

## MANUFACTURER'S DIMENSIONS FOR VEHICLE ATTITUDE

	From Zero X-Plane	From Zero Y-Plane	Height Above Ground (curb wgt)
Front Fiducial Station	32.00 (rear of notch)	32.80	12.93 (top of notch)
Rear of Sliding Cargo Door	98.00	36.06	18.75 (top of sill)
"R" Point	46.50	-19.75	39.84

DATA SHEET 2A  
MONOCULAR OBSTRUCTION ANGLE FROM V<sub>1</sub>  
TEST 3

VEHICLE:

MANUFACTURER Ford Motor Company YEAR 1978  
 MODEL Econoline BODY STYLE Van  
 VIN EO5BHBA2743

LOCATION OF "V" POINT RELATIVE TO THE "R" POINT

	V <sub>1</sub>	V <sub>2</sub>
X	1.28	1.28
Y	-0.20	-0.20
Z	26.55	23.55

OBSTRUCTIONS: Zone 1

<u>Elevation</u>	<u>Obstruction</u>	<u>Left Angle</u>	<u>Right Angle</u>	<u>Obstruction Angle</u>
V <sub>1</sub>	Left wing window frame & left A-pillar	326° 10'	336° 07'	9° 57'

Total 9° 57'

Explanations Pertinent to the Specific Measurements:

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DATA SHEET 2A  
 MONOCULAR OBSTRUCTION ANGLE FROM V<sub>1</sub>  
 TEST 3

VEHICLE:

MANUFACTURER Ford Motor Company YEAR 1978  
 MODEL Econoline BODY STYLE Van  
 VIN EO5BHBA2743

LOCATION OF "V" POINT RELATIVE TO THE "R" POINT

	V <sub>1</sub>	V <sub>2</sub>
X	1.28	1.28
Y	-0.20	-0.20
Z	26.55	23.55

OBSTRUCTIONS: Zone 2

<u>Elevation</u>	<u>Obstruction</u>	<u>Left Angle</u>	<u>Right Angle</u>	<u>Obstruction Angle</u>
V <sub>1</sub>	Right A-pillar & right wing window frame	63° 23'	69° 43'	6° 20'

Total 6° 20'

Explanations Pertinent to the Specific Measurements:

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DATA SHEET 2 A  
MONOCULAR OBSTRUCTION ANGLE FROM V<sub>1</sub>  
TEST 3

VEHICLE:

MANUFACTURER Ford Motor Company YEAR 1978  
 MODEL Econoline BODY STYLE Van  
 VIN EO5BHBA2743

LOCATION OF "V" POINT RELATIVE TO THE "R" POINT

	V <sub>1</sub>	V <sub>2</sub>
X	1.28	1.28
Y	-0.20	-0.20
Z ,	26.55	23.55

OBSTRUCTIONS: Zone IV

<u>Elevation</u>	<u>Obstruction</u>	<u>Left Angle</u>	<u>Right Angle</u>	<u>Obstruction Angle</u>
V <sub>1</sub>	Right B-pillar	90° 21'	99° 01'	8° 40'
V <sub>1</sub>	Right C-pillar	133° 29'	137° 28'	3° 59'
V <sub>1</sub>	Right rear corner pillar	155° 03'	160° 19'	5° 16'
V <sub>1</sub>	Center pillar rear doors	169° 03'	172° 26'	3° 21'

Total 21° 16'

Explanations Pertinent to the Specific Measurements:

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DATA SHEET 2A  
MONOCULAR OBSTRUCTION ANGLE FROM V<sub>2</sub>  
TEST 3

VEHICLE:

MANUFACTURER Ford Motor Company YEAR 1978  
 MODEL Econoline BODY STYLE Van  
 VIN EO5BHBA2743

LOCATION OF "V" POINT RELATIVE TO THE "R" POINT

	V <sub>1</sub>	V <sub>2</sub>
X	1.28	1.28
Y	-0.20	-0.20
Z	26.55	23.55

OBSTRUCTIONS: Zone 1

<u>Elevation</u>	<u>Obstruction</u>	<u>Left Angle</u>	<u>Right Angle</u>	<u>Obstruction Angle</u>
V <sub>2</sub>	Left wing window frame	324° 45'	327° 30'	2° 45'
V <sub>2</sub>	Left A-pillar	329° 21'	336° 31'	7° 10'

Total 9° 55'

Explanations Pertinent to the Specific Measurements:

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DATA SHEET 2A  
 MONOCULAR OBSTRUCTION ANGLE FROM V<sub>2</sub>  
 TEST 3

VEHICLE:

MANUFACTURER Ford Motor Company YEAR 1978  
 MODEL Econoline BODY STYLE Van  
 VIN EO5BHBA2743

LOCATION OF "V" POINT RELATIVE TO THE "R" POINT

	V <sub>1</sub>	V <sub>2</sub>
X	1.28	1.28
Y	-0.20	-0.20
Z	26.55	23.55

OBSTRUCTIONS: Zone 2

<u>Elevation</u>	<u>Obstruction</u>	<u>Left Angle</u>	<u>Right Angle</u>	<u>Obstruction Angle</u>
V <sub>2</sub>	Right A-pillar	61° 48'	66° 52'	5° 04'
V <sub>2</sub>	Right wing window frame	68° 42'	69° 54'	1° 12'

Total 6° 16'

Explanations Pertinent to the Specific Measurements:

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DATA SHEET 2 A  
MONOCULAR OBSTRUCTION ANGLE FROM V<sub>2</sub>  
TEST 3

VEHICLE:

MANUFACTURER Ford Motor Company YEAR 1978  
 MODEL Econoline BODY STYLE Van  
 VIN EO5BHBA2743

LOCATION OF "V" POINT RELATIVE TO THE "R" POINT

	V <sub>1</sub>	V <sub>2</sub>
X	1.28	1.28
Y	-0.20	-0.20
Z	26.55	23.55

OBSTRUCTIONS: Zone 4

<u>Elevation</u>	<u>Obstruction</u>	<u>Left Angle</u>	<u>Right Angle</u>	<u>Obstruction Angle</u>
V <sub>2</sub>	Right B-pillar	90° 19'	99° 02'	8° 43'
V <sub>2</sub>	Right C-pillar	133° 09'	137° 05'	3° 56'
V <sub>2</sub>	Right rear corner pillar	154° 54'	154° 54'	5° 33'
V <sub>2</sub>	Center pillar of rear doors	169° 09'	172° 31'	3° 22'

Total 21° 34'

Explanations Pertinent to the Specific Measurements:

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## DATA SHEET 3

## BINOCULAR OBSTRUCTION ANGLES

## TEST 3

VEHICLE:

MANUFACTURER Ford Motor Company YEAR 1978  
 MODEL Econoline BODY STYLE Van  
 VIN EO5BHBA2743

	Dimensions Relative to SRP		
	X	Y	Z
P <sub>1</sub>	-0.87	-0.80	25.03
P <sub>2</sub>	0.23	+1.85	25.03

Zone: IObstruction Left A-Pillar

Initial Sight to Outboard E - Rear Side	<u>324° 04'</u>	_____	_____
Adjusted Sight to Outboard E - Rear Side	<u>330° 00'</u>	_____	_____
Inboard E - Front Side	<u>335° 30'</u>	_____	_____
Angle to Bench Mark	<u>270° 00'</u>	_____	_____
Obstruction Angle	<u>5° 30'</u>	_____	_____
Azimuth	_____	_____	_____

Zone: II

Obstruction

Initial Sight to Outboard E - Rear Side	<u>71° 19'</u>	_____	_____
Adjusted Sight to Outboard E - Rear Side	<u>30° 00'</u>	_____	_____
Inboard E - Front Side	<u>26° 43'</u>	_____	_____
Angle to Bench Mark	<u>270° 00'</u>	_____	_____
Obstruction Angle	<u>3° 17'</u>	_____	_____
Azimuth	_____	_____	_____

Explanations Pertinent to the Specific Measurements:

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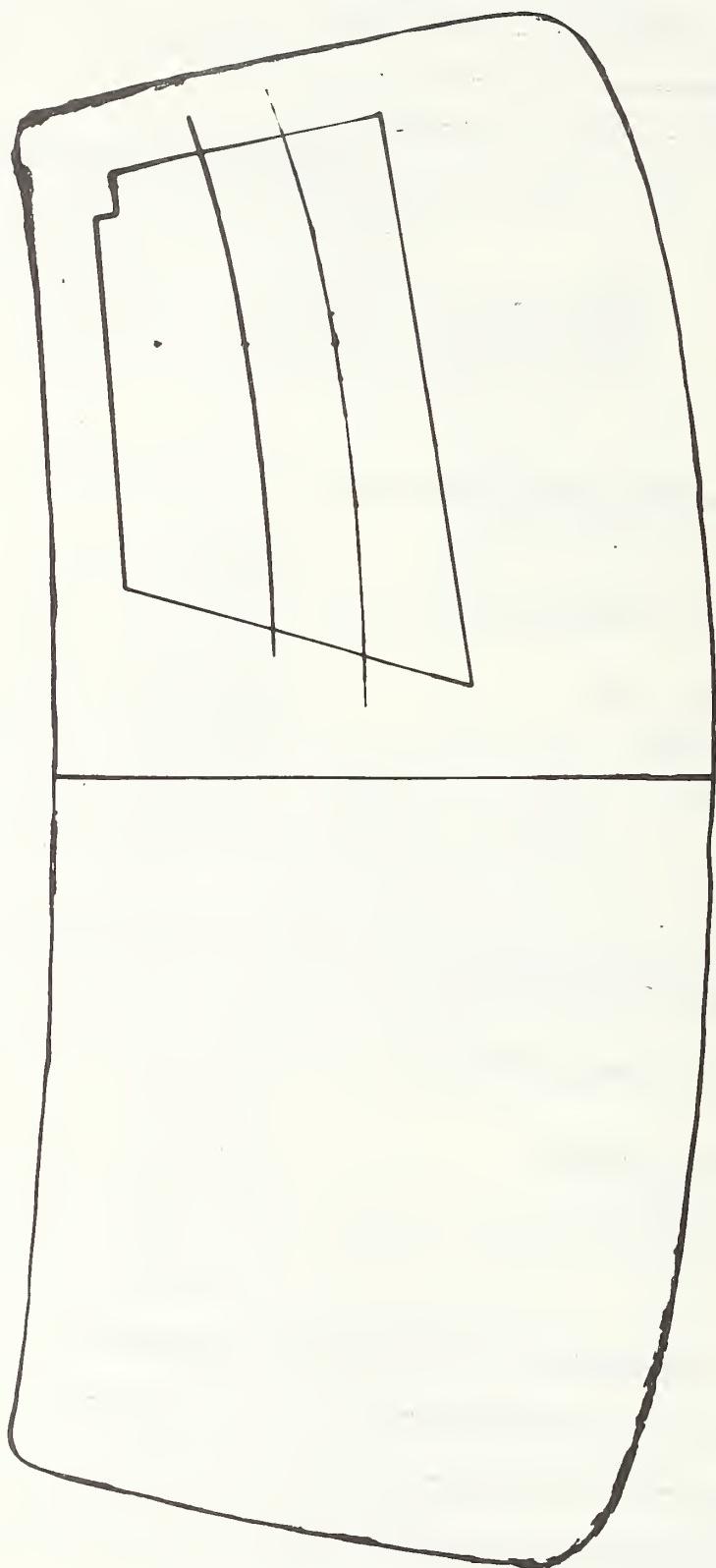


Figure C-36. Ford Econoline E-100 Test No. 3. View Area A.

### Ambinocular Fields of View

The sketches on Page C-5 show the location of the P points relative to the R point. Angular measurements from approximate E points to the mirrors are shown for information only in Data Sheet 5 (see pages C-57 and C-58).

Measured data is compared with the requirements below.

#### Tested as a Passenger Car

	Left Outside Unit Mirror		Right Outside Unit Mirror		Interior Rearview Mirror	
	E7	E8	E5	E6	E5	E6
Test 1 Area (ft <sup>2</sup> )	20.6	20.0	8.7	9.4	7.8	8.7
Net Percent	87		40		27	
Required by Doc- ket No. 71.3a, Notice 4 (Para. 5.1.2.1)	75% of Target SL (Unit Mir- ror)		75% of Target SR (Unit Mir- ror)		60% of Target Q (Unit Mir- ror)	

#### Tested as a Truck

	Left Out- side Unit Mirror		Right Out- side Unit Mirror		Right Out- side Convex Mirror		Front Crossview Mirror	
	E7	E8	E5	E6	E5	E6	E7	E8
Area (ft <sup>2</sup> )	27.0	21.8	15.5	17.4	300	300	12.7	11.7
Net Percent	100		80		50		64	
Required by Doc- ket No. 71.3a, Notice 4 (Para. 5.1.2.2)	95% of Target XL (Unit Mir- ror)		65% of Target XR (Unit Mir- ror)		95% of Tar- get YR		85% of Ground Target (per 5.1.2.3.1)	

NOTE: Mirrors were not necessarily positioned to view the maximum amount of target. Instead, to meet the goals of this program, they were positioned in a standard manner (see Appendix A) in order to evaluate repeatability in positioning the mirror.

Photographs of the views to the flat mirrors from the various eyepoints are included as Figures C-37 through C-50.

## DATA SHEET 5

(As a passenger car)

AMBINOCULAR FIELD OF VIEW  
TEST 3

## VEHICLE:

MANUFACTURER Ford Motor Company YEAR 1978  
 MODEL Econoline BODY STYLE Van  
 VIN E05BHBA2743

	Dimensions Relative to R-Point		
	X	Y	Z
P <sub>3</sub>	4.68	-1.60	25.37
P <sub>4</sub>	4.68	+1.20	25.37

Zone: I\*

Obstruction	Left Outside Mirror	
E <sub>8</sub> - Initial Sight to Vertical Midpoint - Left Side	302° 51'	
E <sub>8</sub> - Adjusted Sight to Vertical Midpoint - Left Side	330° 00'	
Angle to Bench Mark	270°	
E <sub>7</sub> - Angle to Vertical Midpoint - Right Side	347° 25'	

## Azimuth

Zone: <u>II**</u>	Interior Rearview Mirror	Right Outside Mirror
Obstruction		
E <sub>5</sub> - Initial Sight to Vertical Midpoint - Right Side	50° 58'	76° 44'
E <sub>5</sub> - Adjusted Sight to Vertical Midpoint - Right Side	30° 0'	30° 0'
Angle to Bench Mark	270°	270°
E <sub>6</sub> - Angle to Vertical Midpoint - Left Side	6° 45'	22° 21'

## Azimuth

## Explanations Pertinent to the Specific Measurements:

\*Use P<sub>4</sub> hole for E Plate.\*\*Use P<sub>3</sub> hole for E plate.

## DATA SHEET 5

(As a truck)

## AMBINOCULAR FIELD OF VIEW

## TEST 3

## VEHICLE:

MANUFACTURER Ford Motor Co. YEAR 1978  
 MODEL Econoline BODY STYLE Van  
 VIN EO5BHBA2743

	Dimensions Relative to R-Point		
	X	Y	Z
P <sub>3</sub>	4.68	-1.60	25.37
P <sub>4</sub>	4.68	+1.20	25.37

Zone: I\*

Obstruction	Left Outside Mirror	Front Crossview Mirror
E <sub>8</sub> - Initial Sight to Vertical Midpoint - Left Side	302° 38'	337° 54'
E <sub>8</sub> - Adjusted Sight to Vertical Midpoint - Left Side	330° 00'	
Angle to Bench Mark	90°	90°
E <sub>7</sub> - Angle to Vertical Midpoint - Right Side	347° 49'	344° 25'
Azimuth		

Zone: II\*\*

Obstruction	Right Outside Unit Mirror	Right Outside Convex Mirror
E <sub>5</sub> - Initial Sight to Vertical Midpoint - Right Side	76° 50'	77° 35'
E <sub>5</sub> - Adjusted Sight to Vertical Midpoint - Right Side	30° 0'	30° 0'
Angle to Bench Mark	270°	270°
E <sub>6</sub> - Angle to Vertical Midpoint - Left Side	*22° 10'	24° 55'
Azimuth		

## Explanations Pertinent to the Specific Measurements:

\*Blocked by wing window frame, reading is an estimate.\*Use P<sub>4</sub> hole for E Plate.\*\*Use P<sub>3</sub> hole for E plate.



Figure C-37. Ford Econoline E-100 Test No. 3 (as a Passenger Car) Left Flat Mirror From E8.



Figure C-38. Ford Econoline E-100 Test No. 3 (as a Passenger Car) Left Flat Mirror From E7.



Figure C-39. Ford Econoline E-100 Test No. 3 Interior Rearview Mirror as Viewed From E5.



Figure C-40. Ford Econoline E-100 Test No. 3 Interior Rearview Mirror as Viewed From E6.



Figure C-41. Ford Econoline E-100 Test No. 3 (as a Passenger Car) Right Flat Mirror From E6.



Figure C-42. Ford Econoline E-100 Test No. 3 (as a Passenger Car) Right Flat Mirror From E5.



Figure C-43. Ford Econoline E-100 Test No. 3 (as a Truck)  
Left Flat Mirror From E8.



Figure C-44. Ford Econoline E-100 Test No. 3 (as a Truck)  
Left Flat Mirror From E7.



Figure C-45. Ford Econoline E-100 Test No. 3 (as a Truck)  
Right Flat Mirror From E6.



Figure C-46. Ford Econoline E-100 Test No. 3 (as a Truck)  
Right Flat Mirror From E5.



Figure C-47. Ford Econoline E-100 Test No. 3 (as a Truck)  
Right Convex Mirror From E6.



Figure C-48. Ford Econoline E-100 Test No. 3 (as a Truck)  
Right Convex Mirror From E5.



Figure C-49. Ford Econoline E-100 Test No. 3 Front Crossview Mirror From E7.



Figure C-50. Ford Econoline E-100 Test No. 3 Front Crossview Mirror From E8.



**APPENDIX D**  
**IHC TRACTOR**

This appendix contains all the data for the three tests conducted on the IHC TRACTOR. The appendix is organized as follows.

<u>Page No.</u>	<u>Description</u>
D-3	Figures D-1, D-2, and D-3 are views of the test vehicle
D-4	Figure D-4 provides dimensions for Direct Field of View Reference Points
D-5	Figure D-5 provides dimensions for Rearview Mirror Measurement Reference Points
D-6	Vehicle Data Sheet; Test No. 1
D-7-D-12	Direct Field of View Data; Test No. 1
D-13-D-18	Rearview Mirror Data; Test No. 1
D-19	Vehicle Data Sheet; Test No. 2
D-20-D-25	Direct Field of View Data; Test No. 2
D-26-D-31	Rearview Mirror Data; Test No. 2
D-32	Vehicle Data Sheet; Test No. 3
D-33-D-38	Direct Field of View Data; Test No. 3
D-39-D-44	Rearview Mirror Data; Test No. 3



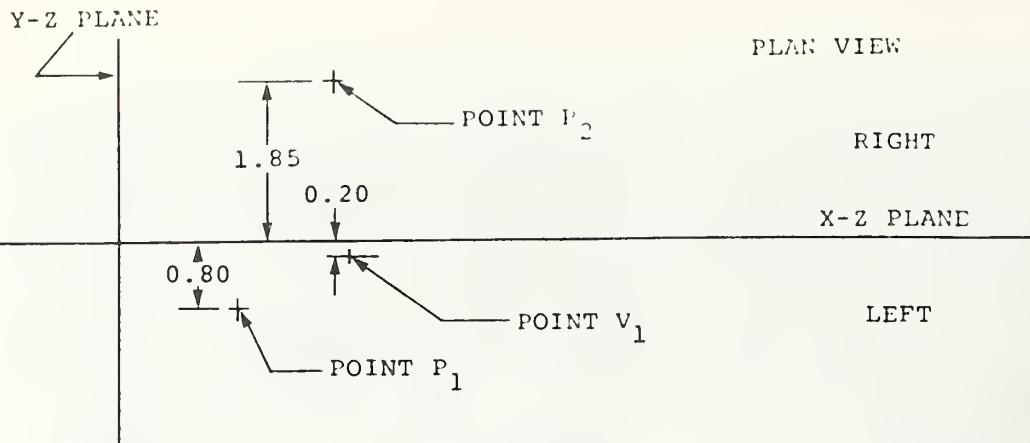
Figure D-1. IHC F-4370  
Left Front  
Quarter View.



Figure D-2. IHC F-4370  
Right Front  
Quarter View.



Figure D-3. IHC F-4370 Rear View.



ELEVATION VIEW

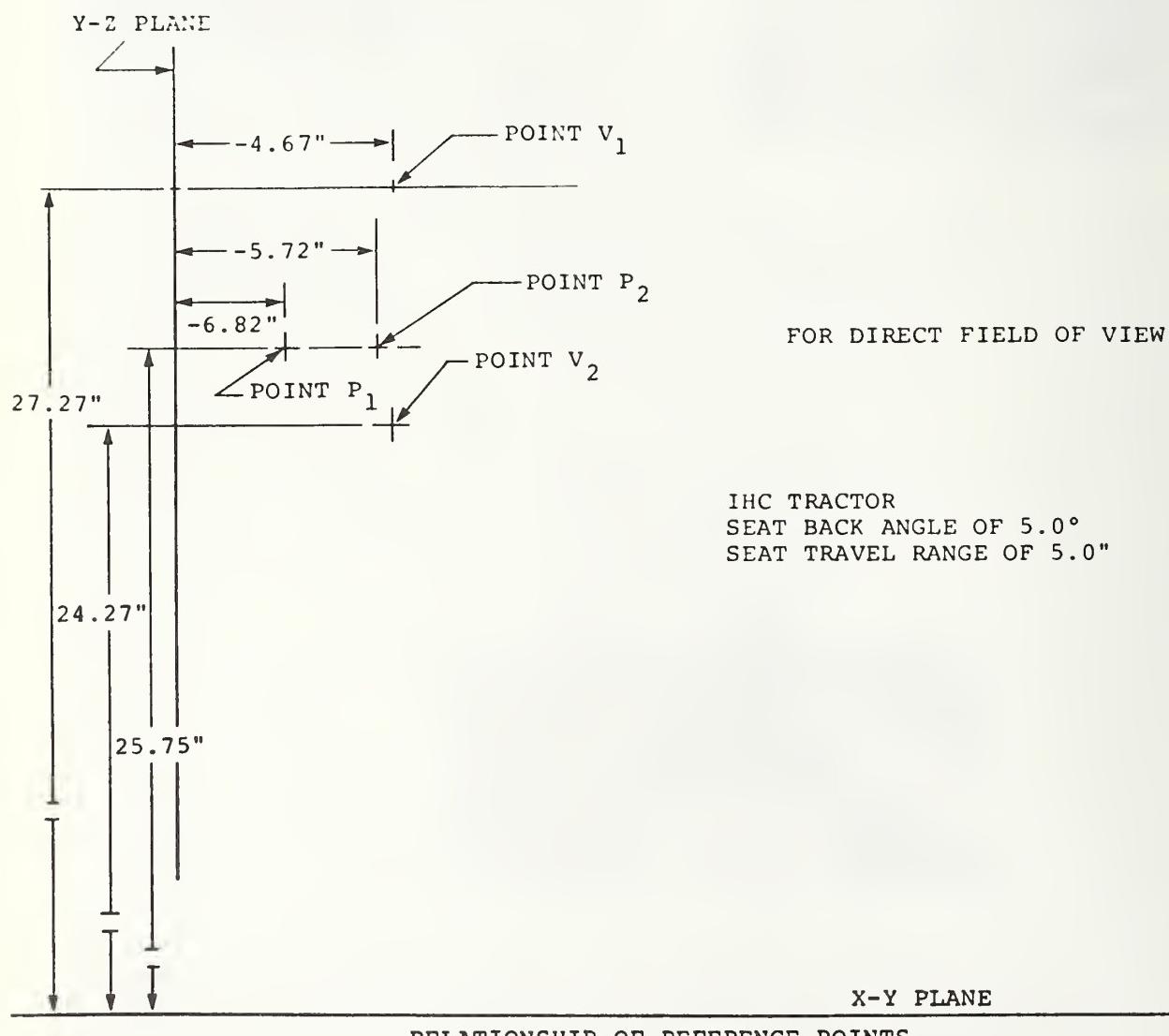


Figure D-4. Relationship of Reference Points for Direct Field of View Measurements.

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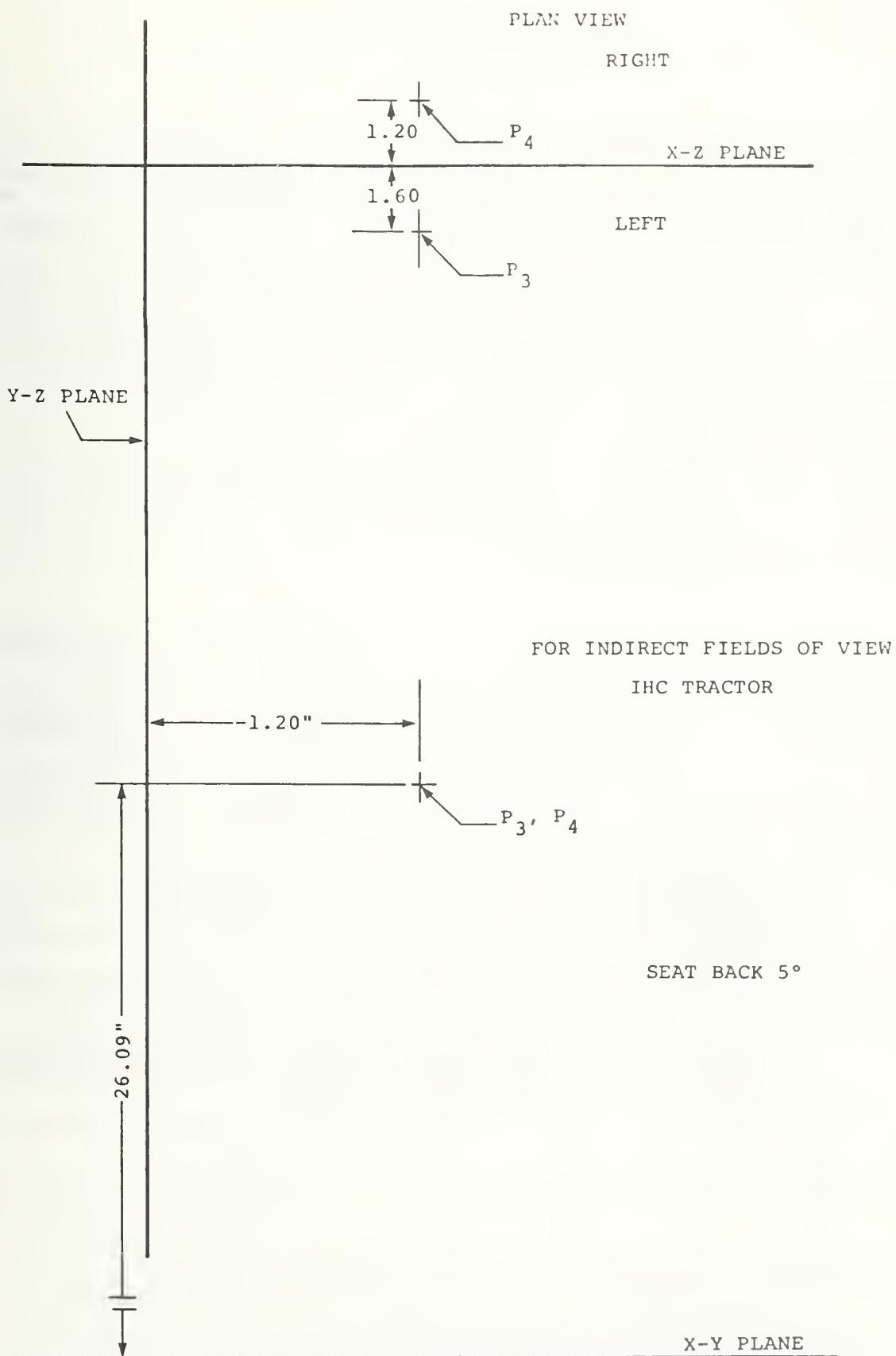


Figure D-5. Relationship of Reference Points for Rearview Mirror Measurements.

## VEHICLE DATA

## TEST 1

## VEHICLE:

MANUFACTURER International Harvester Corp. YEAR 1979  
 MODEL F-4370 BODY STYLE Transtar 4300  
 VIN D2137JGB17100 ODOMETER 45  
 BUILD DATE 1/11/79

SPECIAL OPTIONS \_\_\_\_\_

FRONT SEAT TYPE: SPECIFIED National Cush-N-Aire  
 TILT STEERING WHEEL? YES        NO X  
 FRONT SEAT TRAVEL RANGE: SPECIFIED 5.0 inches  
 FRONT SEAT BACK ANGLE: SPECIFIED 5.0°

## MEASURING POINT CORRECTIONS

	X (in.)	Z (in.)
P From Table 2	-0.88	--
P From Table 3	-7.34	+1.09
Total P	-8.22	--
V From Table 3	-7.34	+1.09

## MANUFACTURER'S REFERENCE POINTS FOR R POINT

For X Not Available to Y-Z Plane \_\_\_\_\_  
 For Y Not Available to X-Z Plane \_\_\_\_\_  
 For Z Not Available to X-Y Plane \_\_\_\_\_

## MANUFACTURER'S DIMENSIONS FOR VEHICLE ATTITUDE (LOADING UNKNOWN)

	From Rear Target	From Longitudinal Plane thru Targets	Height Above Ground
Front Target	25.0	--	49.0
Rear Target	--	--	49.0
"R" Point	1.40 inches forward	*14.5	67.17

\*Measured distance from cab centerline to R point was 19.50 inches.

DATA SHEET 2A  
MONOCULAR OBSTRUCTION ANGLE FROM V1  
TEST 1

VEHICLE:

MANUFACTURER International Harvester Corp. YEAR 1979  
 MODEL F-4370 BODY STYLE Transtar-4300  
 VIN D2137JGB17100

LOCATION OF "V" POINT RELATIVE TO THE "R" POINT

	V <sub>1</sub>	V <sub>2</sub>
X	-4.67	-4.67
Y	-0.20	-0.20
Z ,	27.27	24.27

OBSTRUCTIONS: Zone I

<u>Elevation</u>	<u>Obstruction</u>	<u>Left Angle</u>	<u>Right Angle</u>	<u>Obstruction Angle</u>
V1	Left Outside Unit Mirror	283° 56'	295° 27'	11° 31'
V1	Inner Mirror Support Bracket	299° 04'	301° 00'	1° 56'
V1	Left Wing Window Frame	302° 49'	305° 56'	3° 07'
V1	Left A-Pillar	318° 37'	329° 35'	10° 58'
<b>Total</b>				<b>27° 32'</b>

Explanations Pertinent to the Specific Measurements:

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DATA SHEET 2  
MONOCULAR OBSTRUCTION ANGLE FROM V1  
TEST 1

VEHICLE:

MANUFACTURER International Harvester Corp. YEAR 1979  
 MODEL F-4370 BODY STYLE Transtar 4300  
 VIN D213JGB17100

LOCATION OF "V" POINT RELATIVE TO THE "R" POINT

	<u>V<sub>1</sub></u>	<u>V<sub>2</sub></u>
X	-4.67	-4.67
Y	-0.20	-0.20
Z	27.27	24.27

OBSTRUCTIONS: Zone II

<u>Elevation</u>	<u>Obstruction</u>	<u>Left Angle</u>	<u>Right Angle</u>	<u>Obstruction Angle</u>
V1	Windshield Center Strip	32° 28'	34° 18'	1° 50'
V1	Right A-Pillar	64° 57'	71° 11'	6° 14'
V1	Right Wing Window Frame, Inner Mirror Support Bracket, and Right Outside Unit Mirror*	77° 50'	83° 49'	6° 01'
			Total	14° 05'

Explanations Pertinent to the Specific Measurements:

\*These all run together

DATA SHEET 2B  
MONOCULAR OBSTRUCTION ANGLE FROM V2  
TEST 1

VEHICLE:

MANUFACTURER International Harvester Corp. YEAR 1979  
 MODEL F-4370 BODY STYLE Transtar 4300  
 VIN D213JGB17100

LOCATION OF "V" POINT RELATIVE TO THE "R" POINT

	V <sub>1</sub>	V <sub>2</sub>
X	-4.67	-4.67
Y	-0.20	-0.20
Z ,	27.27	24.27

OBSTRUCTIONS: Zone I

<u>Elevation</u>	<u>Obstruction</u>	<u>Left Angle</u>	<u>Right Angle</u>	<u>Obstruction Angle</u>
V2	Left Outside Unit Mirror	283° 59'	295° 31'	11° 32'
V2	Inner Mirror Support Bracket	298° 39'	300° 33'	1° 54'
V2	Left Wing Window Frame	302° 47'	305° 55'	3° 08'
V2	Left A-Pillar	319° 12'	329° 59'	10° 47'
<u>Total</u>				<u>27° 21'</u>

Explanations Pertinent to the Specific Measurements:

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DATA SHEET 2B  
MONOCULAR OBSTRUCTION ANGLE FROM V2  
TEST 1

VEHICLE:

MANUFACTURER International Harvester Corp. YEAR 1979  
 MODEL F-4370 BODY STYLE Transtar 4300  
 VIN D2137JGB17100

LOCATION OF "V" POINT RELATIVE TO THE "R" POINT

	V <sub>1</sub>	V <sub>2</sub>
X	-4.67	-4.67
Y	-0.20	-0.20
Z	27.27	24.27

OBSTRUCTIONS: Zone II

<u>Elevation</u>	<u>Obstruction</u>	<u>Left Angle</u>	<u>Right Angle</u>	<u>Obstruction Angle</u>
V2	Windshield Center Strip	32° 06'	33° 59'*	1° 53'
V2	Right A-Pillar	64° 35'	70° 48'	6° 13'
V2	**	77° 49'	83° 49'	6° 00'

Total 14° 06'

Explanations Pertinent to the Specific Measurements:

\*Bolt head is in field of view.

\*\*Right Wing Window Frame, Inner Mirror Support Bracket, and Right Outside Unit Mirror (all run together).

DATA SHEET 4  
BINOCULAR OBSTRUCTION ANGLES

VEHICLE:

TEST 1

MANUFACTURER International Harvester Corp. YEAR 1979  
 MODEL F-4370 BODY STYLE Transtar 4300  
 VIN D2137JGB17100

Dimensions Relative to R

	X	Y	Z
<u>P<sub>1</sub></u>	-6.82	-0.80	25.75
<u>P<sub>2</sub></u>	-5.72	+1.85	25.75

Zone: I

Obstruction Left A-Pillar

Initial Sight to Outboard E - Rear Side	<u>310° 42'</u>	_____	_____
Adjusted Sight to Outboard E - Rear Side	<u>330° 00'</u>	_____	_____
Inboard E - Front Side	<u>338° 41'</u>	_____	_____
Angle to Bench Mark	_____	_____	_____
Obstruction Angle	<u>8° 41'</u>	_____	_____
Azimuth	_____	_____	_____

Zone: II

Obstruction Right A-Pillar

Initial Sight to Outboard E - Rear Side	<u>73° 59'</u>	_____	_____
Adjusted Sight to Outboard E - Rear Side	<u>30° 00'</u>	_____	_____
Inboard E - Front Side	<u>25° 49'</u>	_____	_____
Angle to Bench Mark	_____	_____	_____
Obstruction Angle	<u>4° 11'</u>	_____	_____
Azimuth	_____	_____	_____

Explanations Pertinent to the Specific Measurements:

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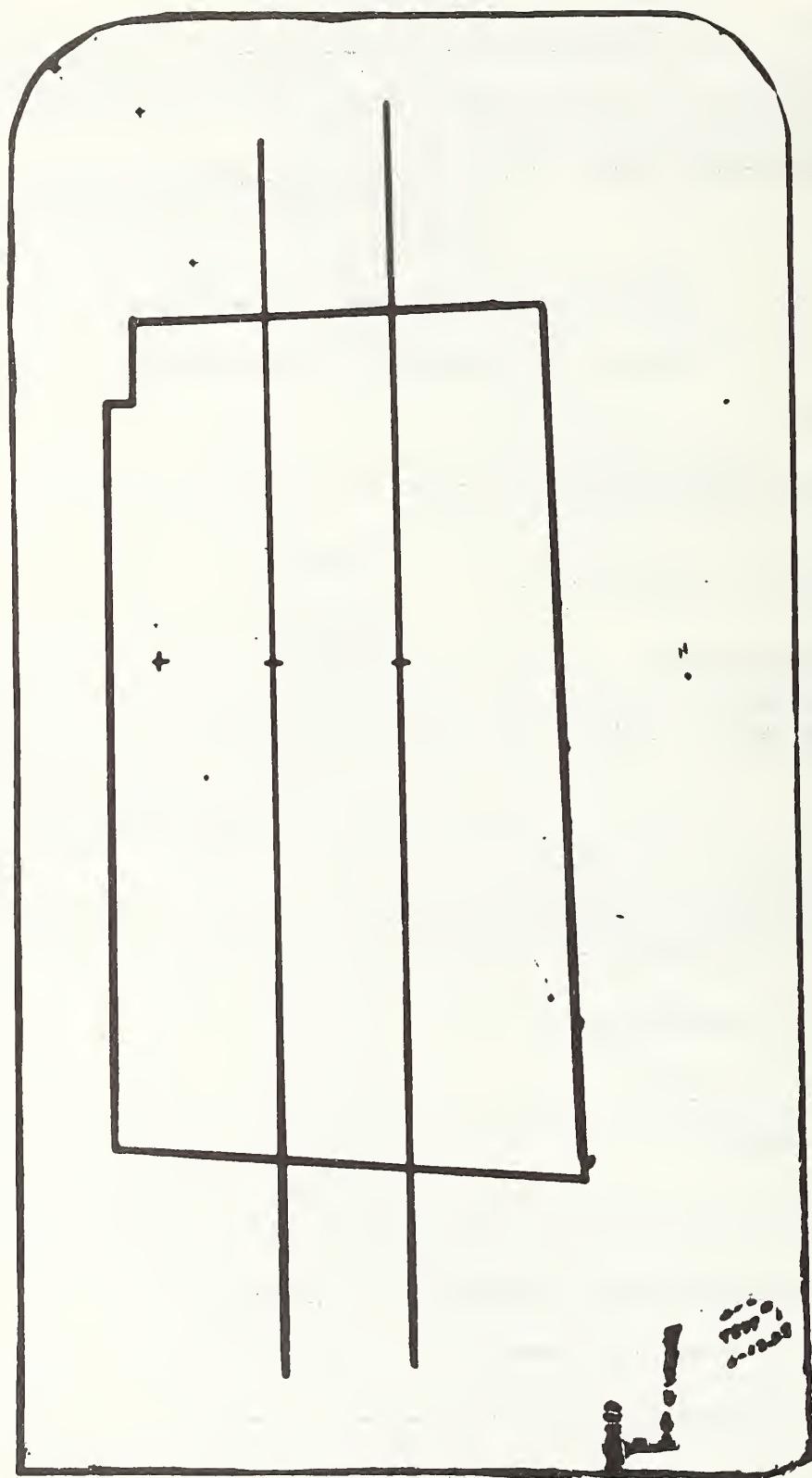


Figure D-6. IHC Tractor Test No. 1. View Area A.

### Ambinocular Fields of View

The sketches on Page D-5 show the location of the P points relative to the R point. Angular measurements from approximate E points to the mirrors are shown for information only in Data Sheet 5 (see page D-14).

Measured data is compared with the requirements below.

#### Tested as a Truck

Test Area (ft <sup>2</sup> )	Left Out-side Unit Mirror		Right Out-side Unit Mirror		Left Out-side Convex Mirror		Right Out-side Convex Mirror	
	E7	E8	E5	E6	E7	E8	E5	E6
19.6	21.7	11.0	11.2	600	600	480	480	
Net Percent	100		61		100		80	
Required by Document No. 71.3a, Notice 4 (Para. 5.1.2.2)	95% of Target XL (Unit Mirror)		65% of Target XR (Unit Mirror)		95% of Target YL (Unit Mirror)		95% of Target YR (Unit Mirror)	

NOTE: Mirrors were not necessarily positioned to view the maximum amount of target. Instead, to meet the goals of this program, they were positioned in a standard manner (see Appendix A) in order to evaluate repeatability in positioning the mirror.

Photographs of the views to the flat mirrors from the various eyepoints are included as Figures D-7 through D-14.

DATA SHEET 5  
AMBINOCULAR FIELD OF VIEW

TEST 1

VEHICLE:

MANUFACTURER International Harvester Corp. YEAR 1979  
 MODEL F-4370 BODY STYLE Transtar 4300  
 VIN D2137JGB17100

	Dimensions Relative to R-Point		
	X	Y	Z
$P_3$	-1.20	-1.60	26.09
$P_4$	-1.20	+1.20	26.09

Zone: I\*

Obstruction	Left Outside Unit Mirror	Left Outside Convex Mirror
$E_8$ - Initial Sight to Vertical Midpoint - Left Side	280° 30'	281° 04'
$E_8$ - Adjusted Sight to Vertical Midpoint - Left Side	330° 00'	330° 0'
Angle to Bench Mark	90°	90°
$E_7$ - Angle to Vertical Midpoint - Right Side	343° 53'	341° 14'
Azimuth		

Zone: II\*\*

Obstruction	Right Outside Unit Mirror	Right Outside Convex Mirror
$E_5$ - Initial Sight to Vertical Midpoint - Right Side	84° 11'	83° 24'
$E_5$ - Adjusted Sight to Vertical Midpoint - Right Side	30° 0'	30° 0'
Angle to Bench Mark	270°	270°
$E_6$ - Angle to Vertical Midpoint - Left Side	24° 26'	25° 19'
Azimuth		

Explanations Pertinent to the Specific Measurements:

\*Use  $P_4$  hole for E Plate.

\*\*Use  $P_3$  hole for E plate.



Figure D-7. IHC F-4370 Test No. 1 Left Flat Mirror From E8.



Figure D-8. IHC F-4370 Test No. 1 Left Flat Mirror From E7.



Figure D-9. IHC F-4370 Test No. 1 Left Convex Mirror From E7.

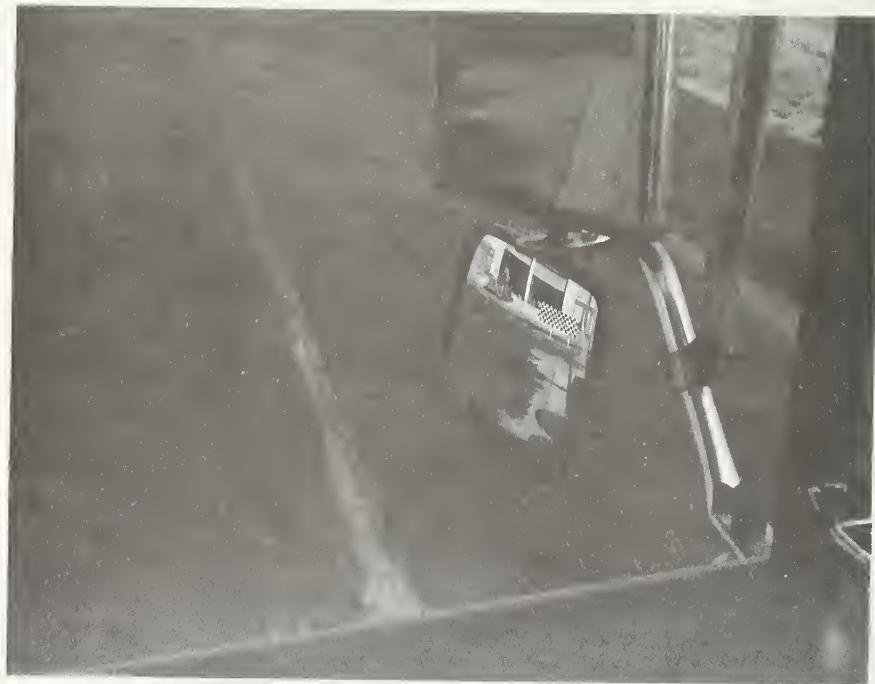


Figure D-10. IHC F-4370 Test No. 1 Left Convex Mirror From E8.



Figure D-11. IHC F-4370 Test No. 1 Right Flat Mirror From E6.



Figure D-12. IHC F-4370 Test No. 1 Right Flat Mirror From E5.



Figure D-13. IHC F-4370 Right Convex Mirror From E6.



Figure D-14. IHC F-4370 Right Convex Mirror From E5.

7/2/79

## DATA SHEET NO. 1

## VEHICLE DATA

## TEST 2

## VEHICLE:

MANUFACTURER International Harvester Corp. YEAR 1979  
 MODEL F-4370 BODY STYLE Transtar 4300  
 VIN D2137JGB17100 ODOMETER 52  
 BUILD DATE 1/11/79  
 SPECIAL OPTIONS \_\_\_\_\_

FRONT SEAT TYPE: SPECIFIED National Cush-N-Aire  
 TILT STEERING WHEEL? YES        NO X  
 FRONT SEAT TRAVEL RANGE: SPECIFIED 5.0 inches  
 FRONT SEAT BACK ANGLE: SPECIFIED 5.0°

## MEASURING POINT CORRECTIONS

	X (in.)	Z (in.)
P From Table 2	<u>-0.88</u>	<u>--</u>
P From Table 3	<u>-7.34</u>	<u>+1.09</u>
Total P	<u>-8.22</u>	<u>--</u>
V From Table 3	<u>-7.34</u>	<u>+1.09</u>

## MANUFACTURER'S REFERENCE POINTS FOR R POINT

For X Not Available to Y-Z Plane \_\_\_\_\_  
 For Y Not Available to X-Z Plane \_\_\_\_\_  
 For Z Not Available to X-Y Plane \_\_\_\_\_

## MANUFACTURER'S DIMENSIONS FOR VEHICLE ATTITUDE (LOADING UNKNOWN)

	From Rear Target	From Longitudinal Plane thru Targets	Height Above Ground
Front Target	25.0	--	49.0
Rear Target	--	--	49.0
"R" Point	1.40 inches forward	*14.5	67.17

\*Measured distance from cab centerline to R point was 19.50 inches.

DATA SHEET 2A  
MONOCULAR OBSTRUCTION ANGLE FROM V1  
TEST 2

VEHICLE:

MANUFACTURER International Harvester Corp. YEAR 1979  
 MODEL F-4370 BODY STYLE Transtar 4300  
 VIN D2137JGB17100

LOCATION OF "V" POINT RELATIVE TO THE "R" POINT

	V <sub>1</sub>	V <sub>2</sub>
X	-4.67	-4.67
Y	-0.20	-0.20
Z	27.27	24.27

OBSTRUCTIONS: Zone I

Elevation	Obstruction	Left Angle	Right Angle	Obstruction Angle
V1	Left Outside Unit Mirror	284° 06'	295° 35'	11° 29'
V1	Inner Mirror Support Bracket	299° 11'	301° 07'	1° 56'
V1	Left Wing Window Frame	302° 59'	306° 07'	3° 08'
V1	Left A-Pillar	318° 47'	329° 49'	11° 01'

Total                 

Explanations Pertinent to the Specific Measurements:

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DATA SHEET 2A  
MONOCULAR OBSTRUCTION ANGLE FROM V1  
TEST 2

VEHICLE:

MANUFACTURER International Harvester Corp. YEAR 1979  
 MODEL F-4370 BODY STYLE Transtar 4300  
 VIN D2137JGB17100

LOCATION OF "V" POINT RELATIVE TO THE "R" POINT

	V <sub>1</sub>	V <sub>2</sub>
X	-4.67	-4.67
Y	-0.20	-0.20
Z	27.27	24.27

OBSTRUCTIONS: Zone II

Elevation	Obstruction	Left Angle	Right Angle	Obstruction Angle
V1	Windshield Center Strip	32° 40'	34° 29'	1° 49'
V1	Right A-Pillar	64° 59'	71° 13'	6° 14'
V1	Right Wing Window Frame	77° 49'	78° 57'	1° 08'
V1	Right Outside Unit Mirror	79° 05'	84° 01'	4° 56'
Total				

Explanations Pertinent to the Specific Measurements:

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DATA SHEET 2B  
MONOCULAR OBSTRUCTION ANGLE FROM V<sub>2</sub>  
TEST 2

VEHICLE:

MANUFACTURER International Harvester Corp. YEAR 1979  
 MODEL F-4370 BODY STYLE Transtar 4300  
 VIN D2137JGB17100

LOCATION OF "V" POINT RELATIVE TO THE "R" POINT

	V <sub>1</sub>	V <sub>2</sub>
X	-4.67	-4.67
Y	-0.20	-0.20
Z ,	27.27	24.27

OBSTRUCTIONS: Zone I

Elevation V <sub>2</sub>	Obstruction	Left Angle	Right Angle	Obstruction Angle
V <sub>2</sub>	Left Outside Unit Mirror	284° 10'	295° 40'	11° 30'
V <sub>2</sub>	Inner Mirror Support Bracket	298° 50'	300° 43'	1° 53'
V <sub>2</sub>	Left Wing Window Frame	303° 01'	306° 09'	3° 08'
V <sub>2</sub>	Left A-Pillar	319° 26'	330° .10'	10° 44'

Total                 

Explanations Pertinent to the Specific Measurements:

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DATA SHEET 2 B  
 MONOCULAR OBSTRUCTION ANGLE FROM V<sub>2</sub>  
 TEST 2

VEHICLE:

MANUFACTURER International Harvester Corp. YEAR 1979  
 MODEL F-4370 BODY STYLE Transtar 4300  
 VIN D2137JGB17100

LOCATION OF "V" POINT RELATIVE TO THE "R" POINT

	V <sub>1</sub>	V <sub>2</sub>
X	-4.67	-4.67
Y	-0.20	-0.20
Z	27.27	24.27

OBSTRUCTIONS: Zone II

Elevation V <sub>2</sub>	Obstruction	Left Angle	Right Angle	Obstruction Angle
V <sub>2</sub>	Window Center Strip	32° 17'	34° 05'	1° 48'
V <sub>2</sub>	Right A-Pillar	64° 37'	70° 49'	6° 12'
V <sub>2</sub>	Right Wing Window Frame	77° 48'	78° 57'	1° 09'
V <sub>2</sub>	Right Inner Mirror Window Frame	Sup. Brkt	Behind Wing	
V <sub>2</sub>	Right Outside Unit Mirror	79° 00'	83° 56'	4° 56'

Total                 

Explanations Pertinent to the Specific Measurements:

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DATA SHEET 3  
BINOCULAR OBSTRUCTION ANGLES  
TEST 2

VEHICLE:

MANUFACTURER International Harvester Corp. YEAR 1979  
 MODEL F-4370 BODY STYLE Transtar 4300  
 VIN D2137JGB17100

	Dimensions Relative to R		
	X	Y	Z
<u>P<sub>1</sub></u>	-6.82	-0.80	25.75
<u>P<sub>2</sub></u>	-5.72	+1.85	25.75

Zone: I

Obstruction Left A-Pillar

Initial Sight to Outboard E - Rear Side	<u>311° 48'</u>	_____	_____
Adjusted Sight to Outboard E - Rear Side	<u>330° 00'</u>	_____	_____
Inboard E - Front Side	<u>338° 44'</u>	_____	_____
Angle to Bench Mark	<u>270° 00'</u>	_____	_____
Obstruction Angle	<u>8° 44'</u>	_____	_____
Azimuth	_____	_____	_____

Zone: II

Obstruction Right A-Pillar

Initial Sight to Outboard E - Rear Side	<u>74° 49'</u>	_____	_____
Adjusted Sight to Outboard E - Rear Side	<u>30° 00'</u>	_____	_____
Inboard E - Front Side	<u>25° 24'</u>	_____	_____
Angle to Bench Mark	<u>270° 00'</u>	_____	_____
Obstruction Angle	<u>4° 36'</u>	_____	_____
Azimuth	_____	_____	_____

Explanations Pertinent to the Specific Measurements:

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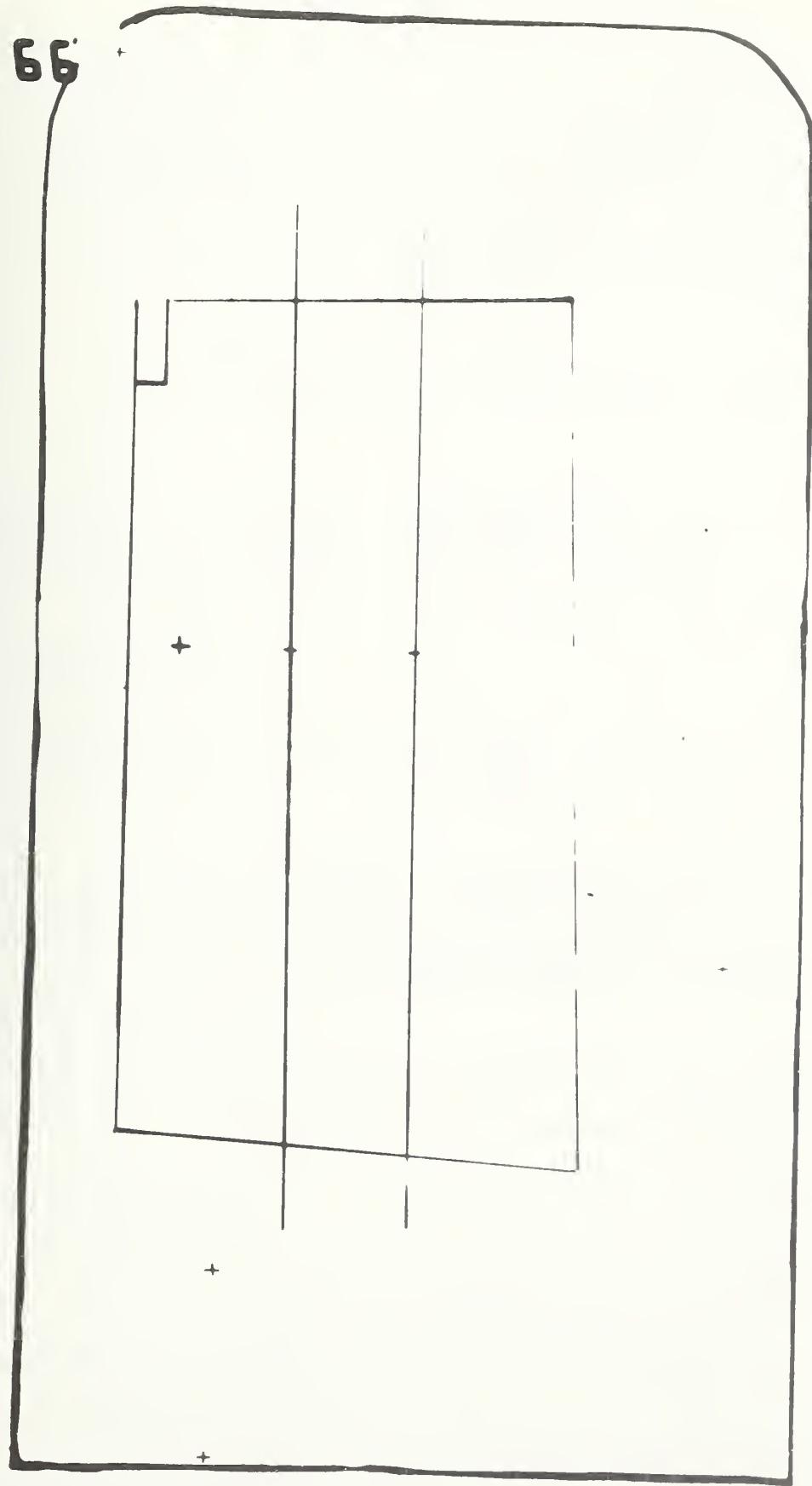


Figure D-25. TMC Tractor Test No. 2. View Area A.

### Ambinocular Fields of View

The sketches on Page D-5 show the location of the P points relative to the R point. Angular measurements from approximate E points to the mirrors are shown for information only in Data Sheet 5 (see page D-27).

Measured data is compared with the requirements below.

	Left Out-side Unit Mirror		Right Out-side Unit Mirror		Left Out-side Convex Mirror		Right Out-side Convex Mirror	
	E7	E8	E5	E6	E7	E8	E5	E6
Test Area (ft <sup>2</sup> )	18.7	20.1	10.7	10.6	600	600	480	480
Net Percent	100		61		100		80	
Required by Document No. 71.3a, Notice 4 (Para. 5.1.2.2)	95% of Target XL (Unit Mirror)		65% of Target XR (Unit Mirror)		95% of Target YL		95% of Target YR	

NOTE: Mirrors were not necessarily positioned to view the maximum amount of target. Instead, to meet the goals of this program, they were positioned in a standard manner (see Appendix A) in order to evaluate repeatability in positioning the mirror.

Photographs of the views to the mirrors from the various eye-points are included as Figures D-16 through D-23.

DATA SHEET 5  
AMBINOCULAR FIELD OF VIEW  
TEST 2

**VEHICLE:**

MANUFACTURER	International Harvester	YEAR	1979
MODEL	F-4370	BODY STYLE	Transtar 4300
VIN	D2137JGB17100		

Dimensions Relative to R-Point

	X	Y	Z
P <sub>3</sub>	-1.20	-1.60	26.09
P <sub>4</sub>	-1.20	+1.20	26.09

Zone: I\*

Obstruction	Left Outside Flat Mirror	Left Outside Convex Mirror
E <sub>8</sub> - Initial Sight to Vertical Midpoint - Left Side	281° 12'	281° 47'
E <sub>8</sub> - Adjusted Sight to Vertical Midpoint - Left Side	330° 00'	330° 0'
Angle to Bench Mark	90°	90°
E <sub>7</sub> - Angle to Vertical Midpoint - Right Side	344° 01'	341° 36'
Azimuth	.	.

Zone: II\*\*

Obstruction	Right Outside Flat Mirror	Right Outside Convex Mirror
E <sub>5</sub> - Initial Sight to Vertical Midpoint - Right Side	85° 06'	84° 25'
E <sub>5</sub> - Adjusted Sight to Vertical Midpoint - Right Side	30° 0'	30° 0'
Angle to Bench Mark	270°	270°
E <sub>6</sub> - Angle to Vertical Midpoint - Left Side	24° 13'	25° 03'
Azimuth	.	.

Explanations Pertinent to the Specific Measurements:

\*Use P<sub>4</sub> hole for E Plate.

\*\*Use P<sub>3</sub> hole for E plate.



Figure D-16. IHC F-4370 Test No. 2 Left Flat Mirror From E8.



Figure D-17. IHC F-4370 Test No. 2 Left Flat Mirror From E7.



Figure D-18. IHC F-4370 Test No. 2 Left Convex Mirror From E7.



Figure D-19. IHC F-4370 Test No. 2 Left Convex Mirror From E8.



Figure D-20. IHC F-4370 Test No. 2 Right Flat Mirror From E6.



Figure D-21. IHC F-4370 Test No. 2 Right Flat Mirror From E5.



Figure D-22. IHC F-4370 Test No. 2 Right Convex Mirror From E6.



Figure D-23. IHC F-4370 Test No. 2 Right Convex Mirror From E5.

18 July 1979

## VEHICLE DATA

TEST 3

## VEHICLE:

MANUFACTURER International Harvester Corp. YEAR 1979  
 MODEL F-4370 BODY STYLE Transtar 4300  
 VIN D2137JGB17100 ODOMETER 59  
 BUILD DATE 1/11/79  
 SPECIAL OPTIONS \_\_\_\_\_

FRONT SEAT TYPE: SPECIFIED National Cush-N-Aire  
 TILT STEERING WHEEL? YES        NO X  
 FRONT SEAT TRAVEL RANGE: SPECIFIED 5.0 inches  
 FRONT SEAT BACK ANGLE: SPECIFIED 5.0°

## MEASURING POINT CORRECTIONS

	X (in.)	Z (in.)
P From Table 2	-0.88	--
P From Table 3	-7.34	+1.09
Total P	-8.22	--
V From Table 3	-7.34	+1.09

## MANUFACTURER'S REFERENCE POINTS FOR R POINT

For X Not Available to Y-Z Plane \_\_\_\_\_  
 For Y Not Available to X-Z Plane \_\_\_\_\_  
 For Z Not Available to X-Y Plane \_\_\_\_\_

## MANUFACTURER'S DIMENSIONS FOR VEHICLE ATTITUDE (LOADING UNKNOWN)

	From Rear Target	From Longitudinal Plane thru Targets	Height Above Ground
Front Target	25.0	--	49.0
Rear Target	--	--	49.0
"R" Point	1.40 inches forward	*14.5	67.17

\*Measured distance from cab centerline to R point was 19.50 inches.

DATA SHEET 2 A  
MONOCULAR OBSTRUCTION ANGLE FROM V<sub>1</sub>  
TEST 3

VEHICLE:

MANUFACTURER International Harvester Corp. YEAR 1979  
 MODEL F-4370 BODY STYLE Transtar 4300  
 VIN D2137JGB17100

LOCATION OF "V" POINT RELATIVE TO THE "R" POINT

	V <sub>1</sub>	V <sub>2</sub>
X	-4.67	-4.67
Y	-0.20	-0.20
Z	27.27	24.27

OBSTRUCTIONS: Zone I

Elevation	Obstruction	Left Angle	Right Angle	Obstruction Angle
V <sub>1</sub>	Left Outside Unit Mirror	284° 15'	295° 43'	11° 28'
V <sub>1</sub>	Inner Mirror Support Bracket	299° 22'	301° 18'	1° 56'
V <sub>1</sub>	Left Wing Window Frame	303° 12'	306° 20'	3° 08'
V <sub>1</sub>	Left A-Pillar	318° 59'	329° 58'	10° 59'

Cont'd-

Total \_\_\_\_\_

Explanations Pertinent to the Specific Measurements:

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DATA SHEET 2  
MONOCULAR OBSTRUCTION ANGLE FROM V1  
TEST 3

VEHICLE:

MANUFACTURER International Harvester Corp. YEAR 1979  
 MODEL F-4370 BODY STYLE Transtar 4300  
 VIN D2137JGB17100

LOCATION OF "V" POINT RELATIVE TO THE "R" POINT

	V <sub>1</sub>	V <sub>2</sub>
X	-4.67	-4.67
Y	-0.20	-0.20
Z ,	27.27	24.27

OBSTRUCTIONS: Zone I

<u>Elevation</u> <u>V<sub>1</sub></u>	<u>Obstruction</u> Window Center Strip	<u>Left Angle</u> 32° 45'	<u>Right Angle</u> 34° 34'	<u>Obstruction Angle</u> 1° 49'
V <sub>1</sub>	Right A-Pillar	65° 02'	71° 16'	6° 14'
V <sub>1</sub>	Right Wing Window Frame	77° 54'	79° 01'	1° 07'
V <sub>1</sub>	Right Outside Unit Mirror	79° 12'	84° 02'	4° 50'

Cont'd.

Total \_\_\_\_\_

Explanations Pertinent to the Specific Measurements:

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DATA SHEET 2 B  
MONOCULAR OBSTRUCTION ANGLE FROM V<sub>2</sub>  
TEST 3

VEHICLE:

MANUFACTURER International Harvester Corp. YEAR 1979  
 MODEL F-4370 BODY STYLE Transtar 4300  
 VIN D2137JGB17100

LOCATION OF "V" POINT RELATIVE TO THE "R" POINT

	V <sub>1</sub>	V <sub>2</sub>
X	-4.67	-4.67
Y	-0.20	-0.20
Z	27.27	24.27

OBSTRUCTIONS: Zone II

Elevation V <sub>2</sub>	Obstruction	Left Angle	Right Angle	Obstruction Angle
V <sub>2</sub>	Left Outside Unit Mirror	284° 17'	295° 46'	11° 29'
V <sub>2</sub>	Left Inner Mirror Sup. Brk.	298° 57'	300° 51'	1° 54'
V <sub>2</sub>	Left Wing Window Frame	303° 10'	306° 20'	3° 10'
V <sub>2</sub>	Left A-Pillar	319° 35'	330° 20'	10° 45'

Cont'd.

Total \_\_\_\_\_

Explanations Pertinent to the Specific Measurements:

DATA SHEET 2B  
MONOCULAR OBSTRUCTION ANGLE FROM V2  
TEST 3

VEHICLE:

MANUFACTURER International Harvester Corp. YEAR 1979  
 MODEL F-4370 BODY STYLE Transtar 4300  
 VIN D2137JGB17100

LOCATION OF "V" POINT RELATIVE TO THE "R" POINT

	V <sub>1</sub>	V <sub>2</sub>
X	-4.67	-4.67
Y	-0.20	-0.20
Z	27.27	24.27

OBSTRUCTIONS: Zone II

<u>Elevation</u> <u>V<sub>2</sub></u>	<u>Obstruction</u>	<u>Left Angle</u>	<u>Right Angle</u>	<u>Obstruction Angle</u>
V <sub>2</sub>	Windshield Center Strip	32° 22'	34° 11'	1° 49'
V <sub>2</sub>	Right A-Pillar	64° 39'	70° 53'	6° 14'
V <sub>2</sub>	Right Wing Window Frame	77° 51'	79° 00'	1° 09'
V <sub>2</sub>	Right Outside Unit Mirror	79° 05'	83° 55'	4° 50'

Cont'd.

Total \_\_\_\_\_

Explanations Pertinent to the Specific Measurements:

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## DATA SHEET 3

BINOCULAR OBSTRUCTION ANGLES  
TEST 3

## VEHICLE:

MANUFACTURER International Harvester Corp. YEAR 1979  
 MODEL F-4370 BODY STYLE Transtar 4300  
 VIN D2137JGB17100

	Dimensions Relative to R		
	X	Y	Z
$P_1$	-6.82	-0.80	25.75
$P_2$	-5.72	+1.85	25.75

Zone: IObstruction Left A-PillarInitial Sight to Outboard E -  
Rear Side312° 44' \_\_\_\_\_Adjusted Sight to Outboard E -  
Rear Side330° 00' \_\_\_\_\_

Inboard E - Front Side

338° 48' \_\_\_\_\_

Angle to Bench Mark

270° 00' \_\_\_\_\_

Obstruction Angle

8° 48' \_\_\_\_\_

Azimuth

\_\_\_\_\_ \_\_\_\_\_

Zone: IIObstruction Right A-PillarInitial Sight to Outboard E -  
Rear Side74° 52' \_\_\_\_\_Adjusted Sight to Outboard E -  
Rear Side30° 00' \_\_\_\_\_

Inboard E - Front Side

25° 30' \_\_\_\_\_

Angle to Bench Mark

270° 00' \_\_\_\_\_

Obstruction Angle

4° 30' \_\_\_\_\_

Azimuth

\_\_\_\_\_ \_\_\_\_\_

## Explanations Pertinent to the Specific Measurements:

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21 L66

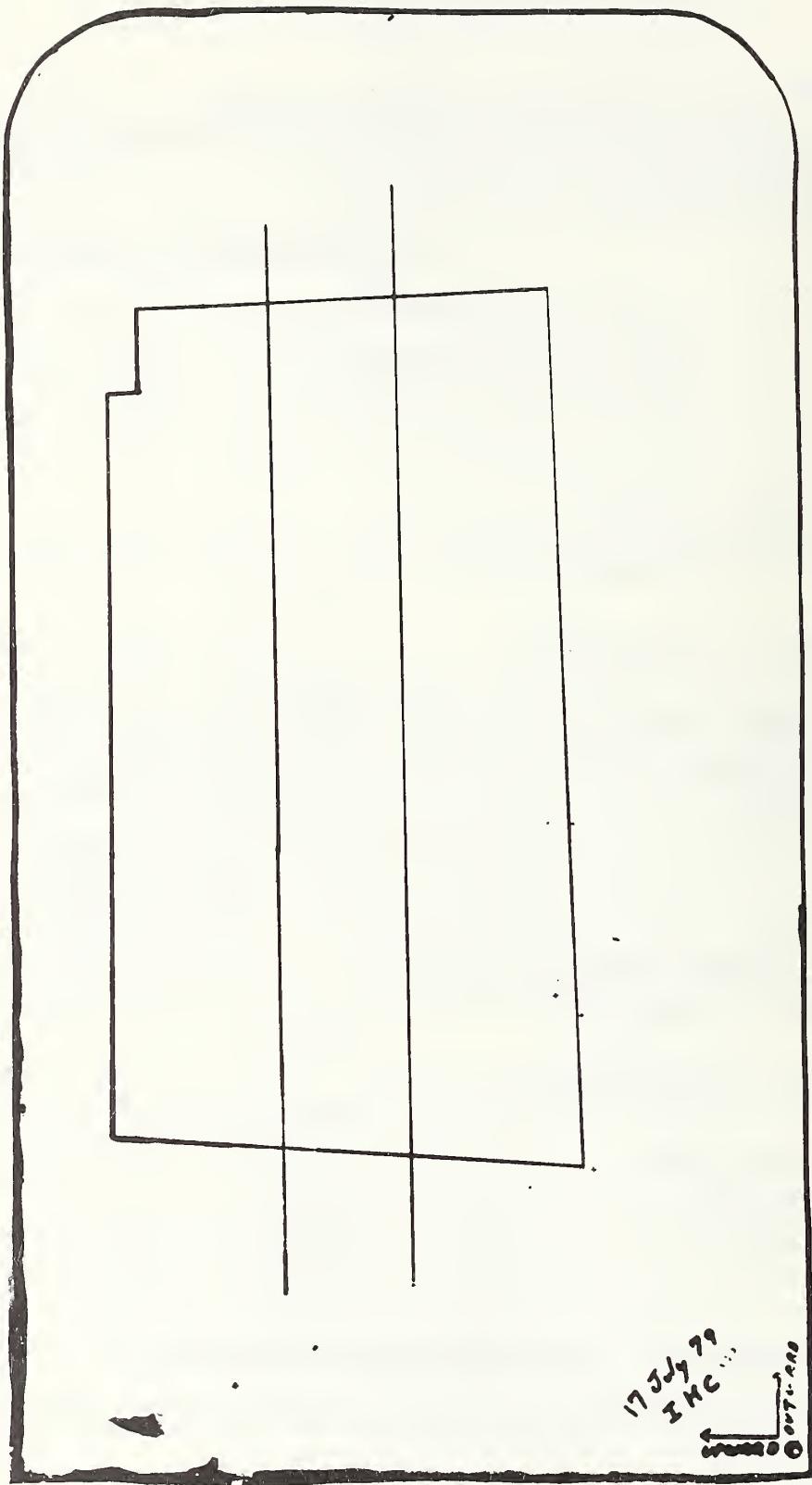


Figure D-24. IHC Tractor Test No. 3. View Area A.

### Ambinocular Fields of View

The sketches on Page D-5 show the location of the P points relative to the R point. Angular measurements from approximate E points to the mirrors are shown for information only in Data Sheet 5 (see page D-40).

Measured data is compared with the requirements below.

	Left Out-side Unit Mirror		Right Out-side Unit Mirror		Left Out-side Convex Mirror		Right Out-side Convex Mirror	
	E7	E8	E5	E6	E5	E6	E7	E8
Test Area (ft <sup>2</sup> )	18.9	22.5	11.2	12.0	600	600	480	480
Net Percent	100		61		100		80	
Required by Document No. 71.3a, Notice 4 (Para. 5.1.2.2)	95% of Target XL (Unit Mirror)		65% of Target XR (Unit Mirror)		95% of Target YL		95% of Target YR	

NOTE: Mirrors were not necessarily positioned to view the maximum amount of target. Instead, to meet the goals of this program, they were positioned in a standard manner (see Appendix A) in order to evaluate repeatability in positioning the mirror.

Photographs of the views to the mirrors from the various eye-points are included as Figures D-25 through D-32.

DATA SHEET 5  
AMBINOCULAR FIELD OF VIEW  
TEST 3

VEHICLE:

MANUFACTURER International Harvester Corp. YEAR 1979  
 MODEL F-4370 BODY STYLE Transtar 4300  
 VIN D2137JGB17100

	Dimensions Relative to R-Point		
	X	Y	Z
<u>P<sub>3</sub></u>	-1.20	-1.60	26.09
<u>P<sub>4</sub></u>	-1.20	+1.20	26.09

Zone: I\*

Obstruction	Left Outside Unit	Left Outside Convex Mirror
E <sub>8</sub> - Initial Sight to Vertical Midpoint - Left Side	281° 19'	281° 59'
E <sub>8</sub> - Adjusted Sight to Vertical Midpoint - Left Side	330° 00'	330° 0'
Angle to Bench Mark	90° 00'	90° 00'
E <sub>7</sub> - Angle to Vertical Midpoint - Right Side	344° 02'	341° 39'
Azimuth		

Zone: II\*\*

Obstruction	Right Outside Unit Mirror	Right Outside Convex Mirror
E <sub>5</sub> - Initial Sight to Vertical Midpoint - Right Side	85° 09'	84° 25'
E <sub>5</sub> - Adjusted Sight to Vertical Midpoint - Right Side	30° 0'	30° 0'
Angle to Bench Mark	270°	270°
E <sub>6</sub> - Angle to Vertical Midpoint - Left Side	24° 13'	25° 07'
Azimuth		

Explanations Pertinent to the Specific Measurements:

\*Use P<sub>4</sub> hole for E Plate.

\*\*Use P<sub>3</sub> hole for E plate.



Figure D-25. IHC F-4370 Test No. 3 Left Flat Mirror From E8.



Figure D-26. IHC F-4370 Test No. 3 Left Flat Mirror From E7.



Figure D-27. IHC F-4370 Test No. 3 Left Convex Mirror From E7.



Figure D-28. IHC F-4370 Test No. 3 Left Convex Mirror From E8.



Figure D-29. IHC F-4370 Test No. 3 Right Flat Mirror From E6.



Figure D-30. IHC F-4370 Test No. 3 Right Flat Mirror From E5.



Figure D-31. IHC F-4370 Test No. 3 Right Convex Mirror From E6.



Figure D-32. IHC F-4370 Test No. 3 Right Convex Mirror From E5.

APPENDIX E

PHOTOGRAPHIC DOCUMENTATION OF VEHICLE AND  
MIRROR POSITIONING REPEATABILITY

The photographs in this Appendix were made to document: (1) repeatability in the vehicle positioning procedure, and (2) repeatability in the mirror adjustment procedure. The table below serves as a guide in determining the subject matter of the photographs.

	Figure Numbers				
	AMC Concord	Ford Econoline As a Pas- senger Car	As a Truck	IHC Tractor	Procedure Callout in Appendix A
<u>*Vehicle Positioning Repeatability</u>					
- Front	1-3	19-21		48-50	Sec. F-1
- Rear	4-6	22-24			Sec. F-2
<u>Mirror Adjustment Repeatability</u>					
- Left Outside Unit	7-10	25-27	34-37	51-54	Sections G-3, H-4, and I-3
- Interior Rearview	11-14	28-30			Sections G-1, H-1
- Right Cut-side Unit	15-18	31-33	38-41	58-61	Sections G-2, H-2, and I-1

\*To determine vehicle positioning repeatability, three small targets were placed on the vehicle window and three targets on the reference framework outside the vehicle. These targets are indicated in the photos by means of small arrows drawn to them.



Figure E-1. AMC Concord Front Targets Representing Vehicle Position Repeatability Test 1.

NOTE: Picture appears to have been shot from V2 rather than V1.



Figure E-2. AMC Concord Front Targets Representing Vehicle Position Repeatability Test 2.

NOTE: Hood is Partially Open.



Figure E-3. AMC Concord Front Targets Representing Vehicle Position Repeatability Test 3.

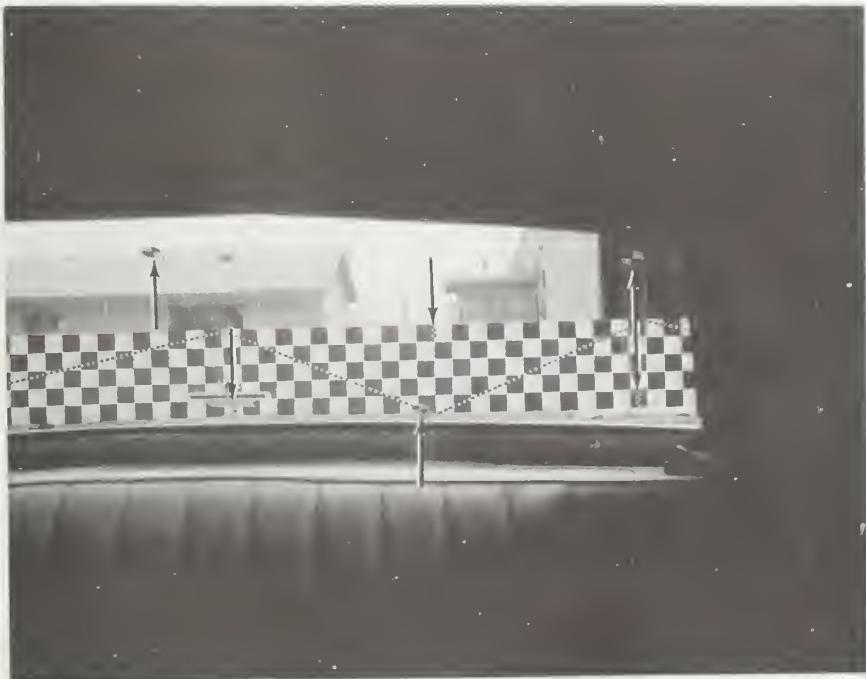


Figure E-4. AMC Concord Rear Targets Representing Vehicle Position Repeatability Test 1.

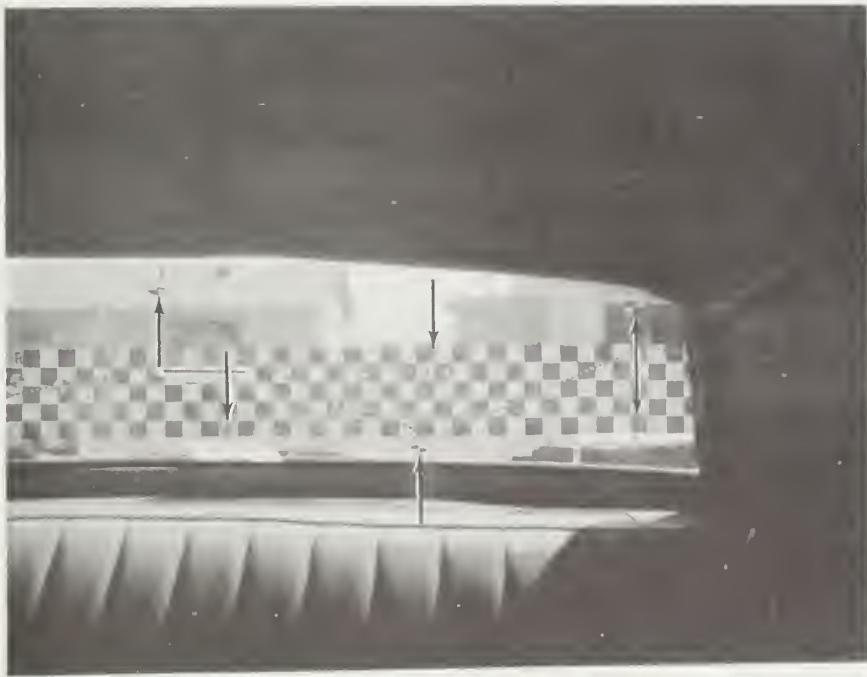


Figure E-5. AMC Concord Rear Targets Representing Vehicle Position Repeatability Test 2.

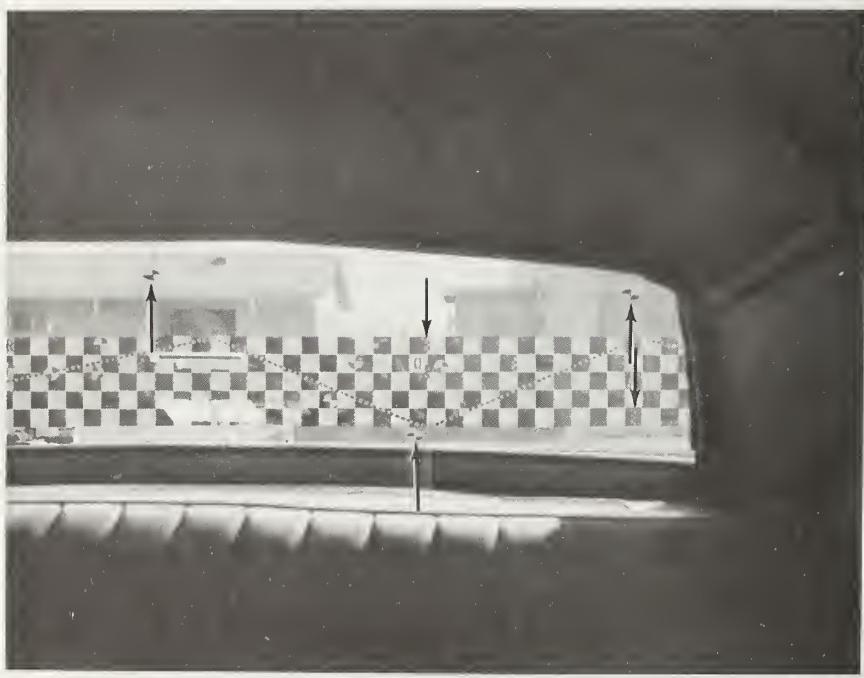


Figure E-6. AMC Concord Rear Targets Representing Vehicle Position Repeatability Test 3.



Figure E-7. AMC Concord Left Outside Mirror Positioning Repeatability Test 1.



Figure E-8. AMC Concord Left Outside Mirror Positioning Repeatability Test 2.

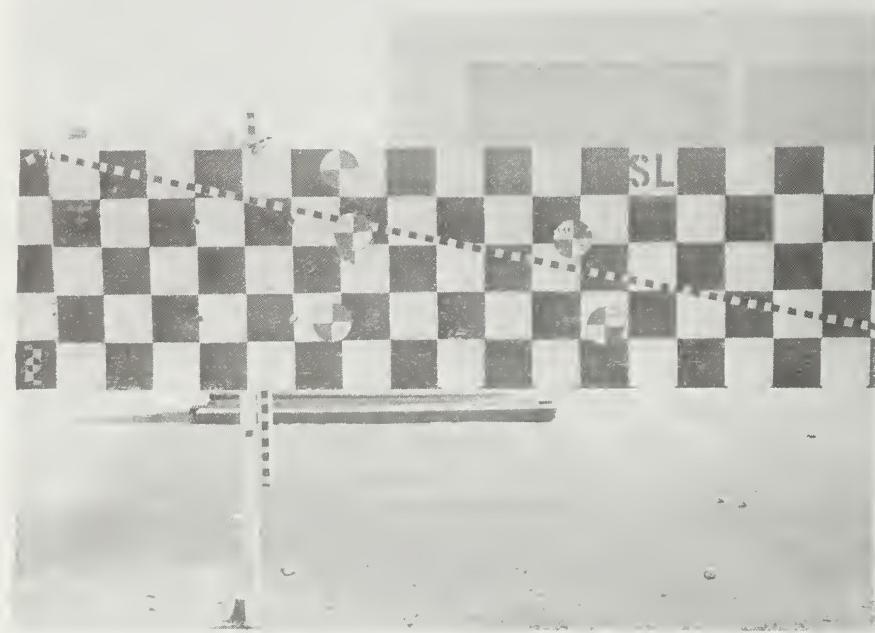
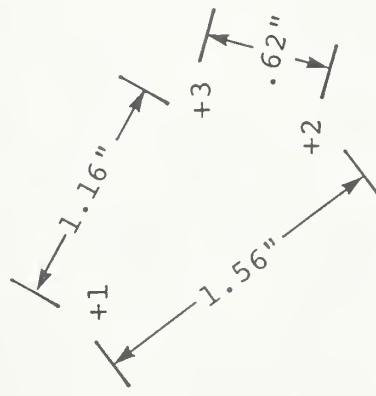


Figure E-9. AMC Concord Left Outside Mirror Positioning Repeatability Test 3.

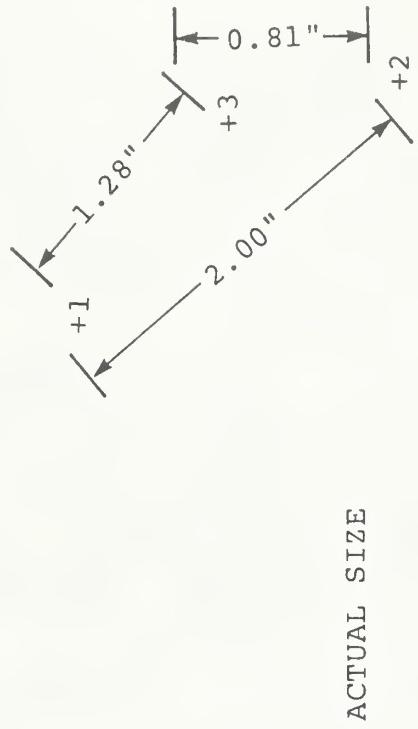
MIRROR SETUP REPEATABILITY - AMC CONCORD

609E0606

EYEPOINT 7L



EYEPOINT 8L



AS SEEN FROM E7

AS SEEN FROM E8

Figure E-10. Projection of Left Outside Unit Mirror Upon Target Board.

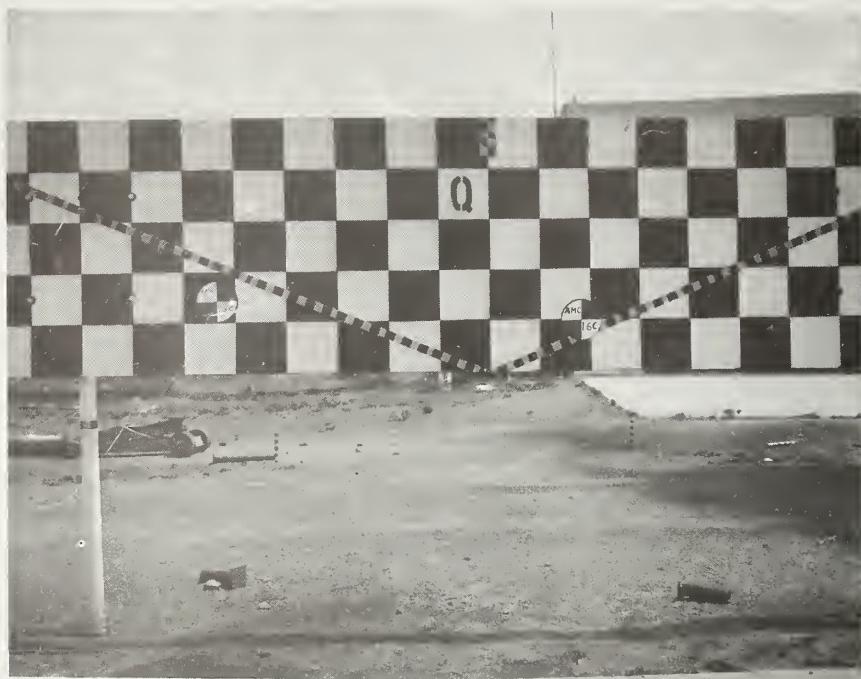


Figure E-11. AMC Concord Interior Rearview Mirror Positioning Repeatability Test 1.

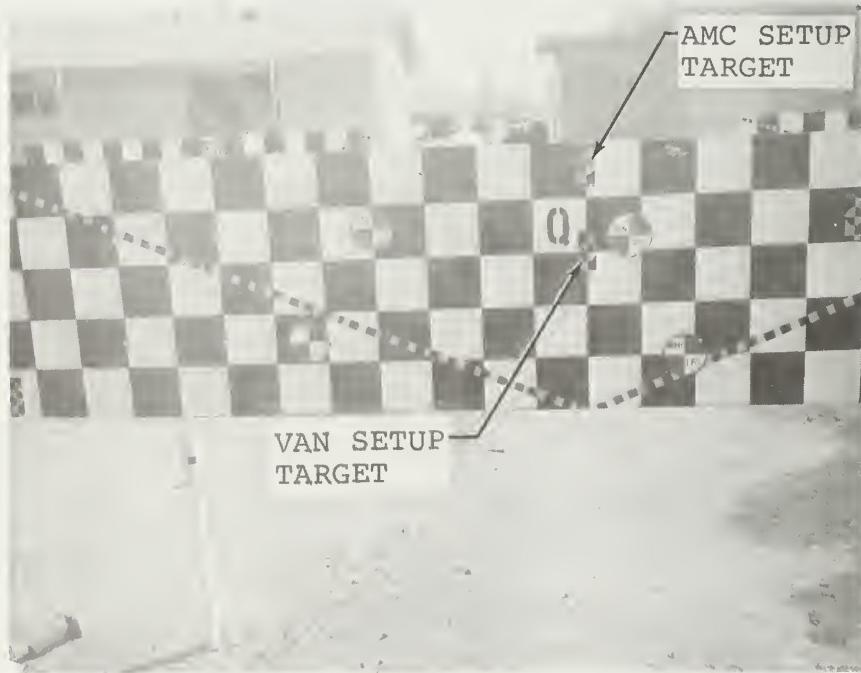


Figure E-12. AMC Concord Interior Rearview Mirror Positioning Repeatability Test 2.

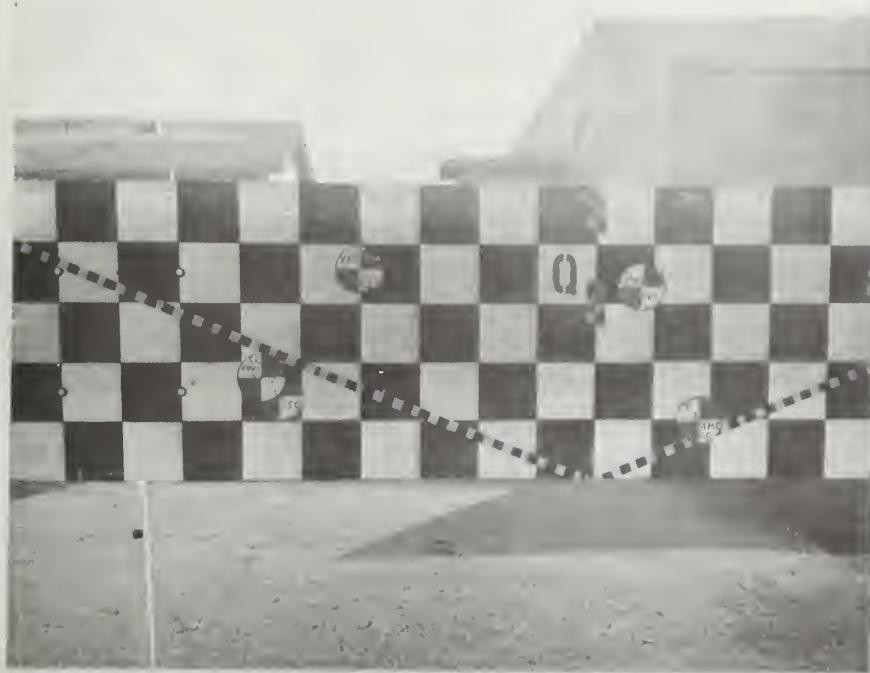


Figure E-13. AMC Concord Interior Rearview Mirror Positioning Repeatability Test 3.

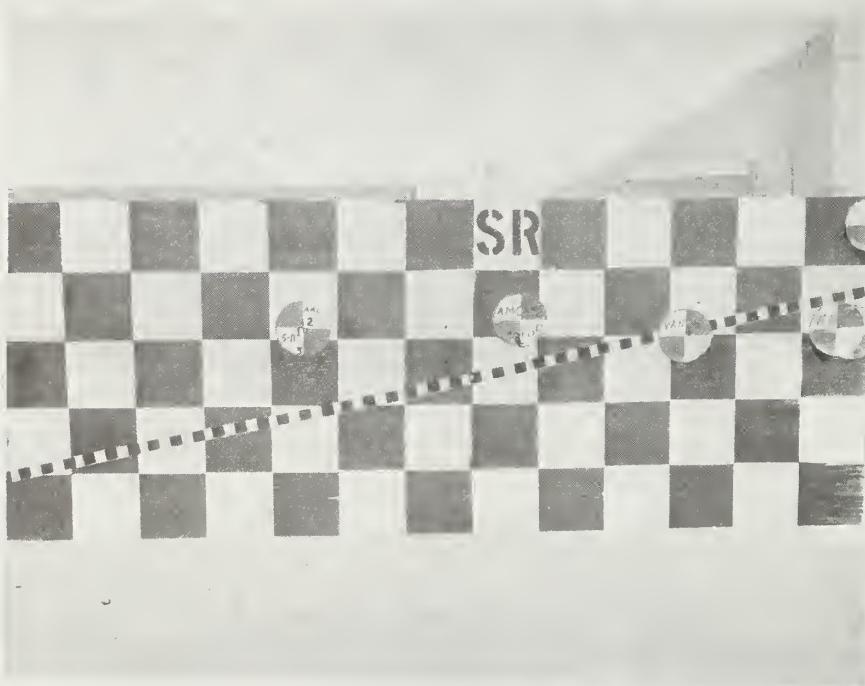
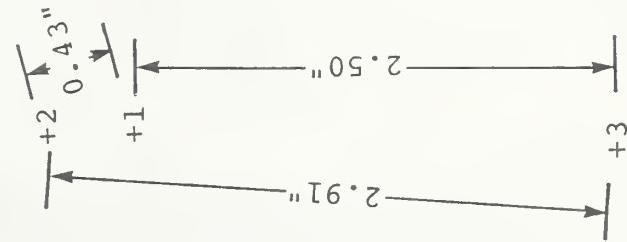


Figure E-17. AMC Concord Right Outside Mirror Positioning Repeatability Test 3.

AMC CONCORD

40980606

EYEPOINT 5R



EYEPOINT 6R

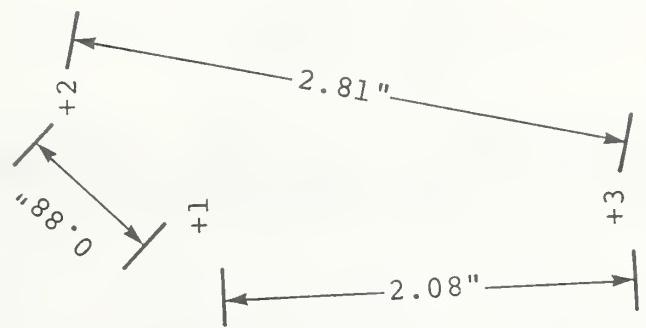


Figure E-18. Projection of Right Outside Mirror Geometric Center Upon Target Board.

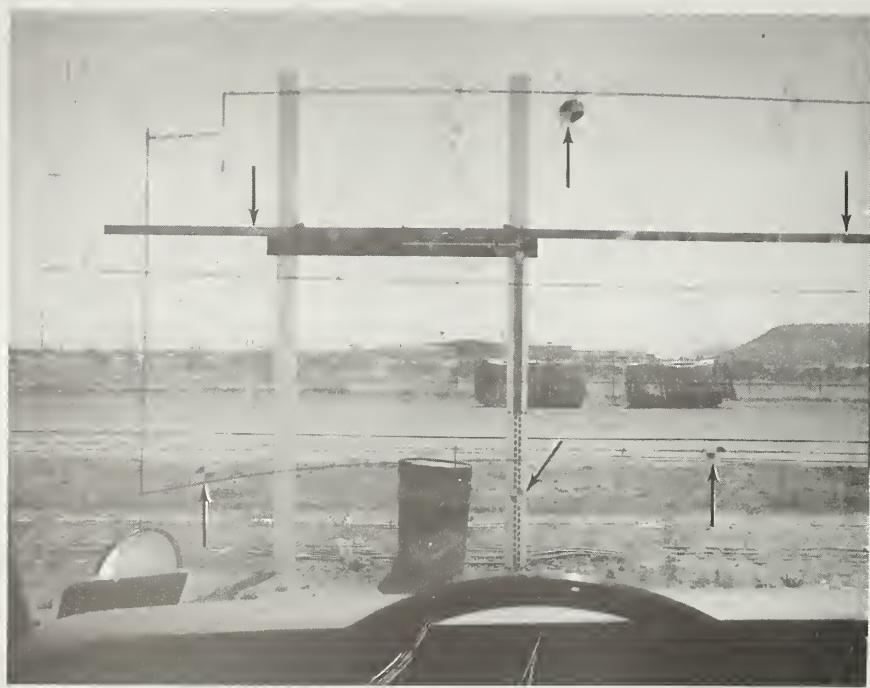


Figure E-19. Ford Econoline E-100 Front Targets Representing Vehicle Position Repeatability Test 1.

NOTE: Picture appears to have been shot from V2 rather than V1.



Figure E-20. Ford Econoline E-100 Front Targets Representing Vehicle Position Repeatability Test 2.

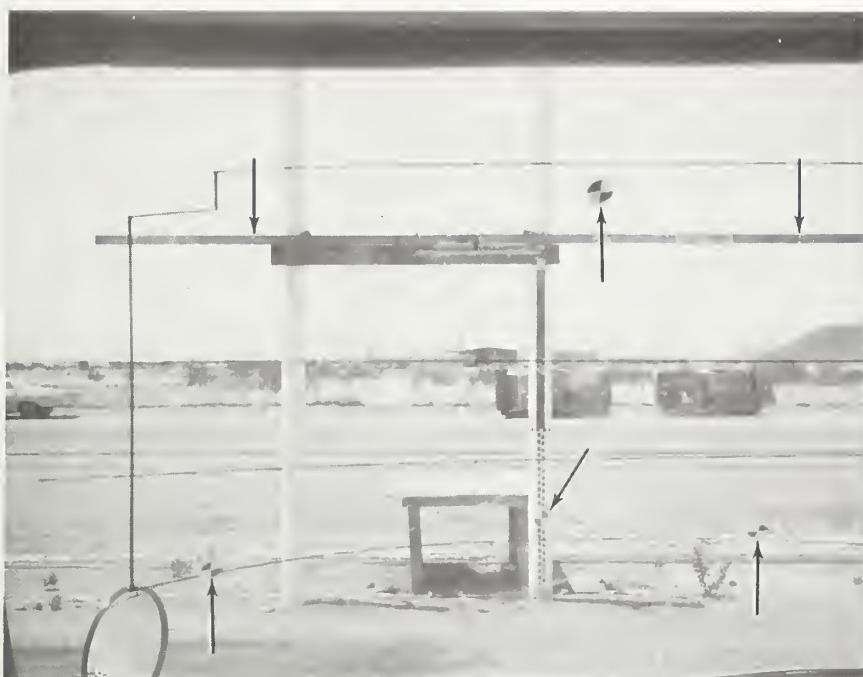


Figure E-21. Ford Econoline E-100 Front Targets Representing Vehicle Position Repeatability Test 3.



Figure E-22. Ford Econoline E-100 Rear Targets Representing Vehicle Position Repeatability Test 1.



Figure E-23. Ford Econoline E-100 Rear Targets Representing Vehicle Position Repeatability Test 2.



Figure E-24. Ford Econoline E-100 Rear Targets Representing Vehicle Position Repeatability Test 3.

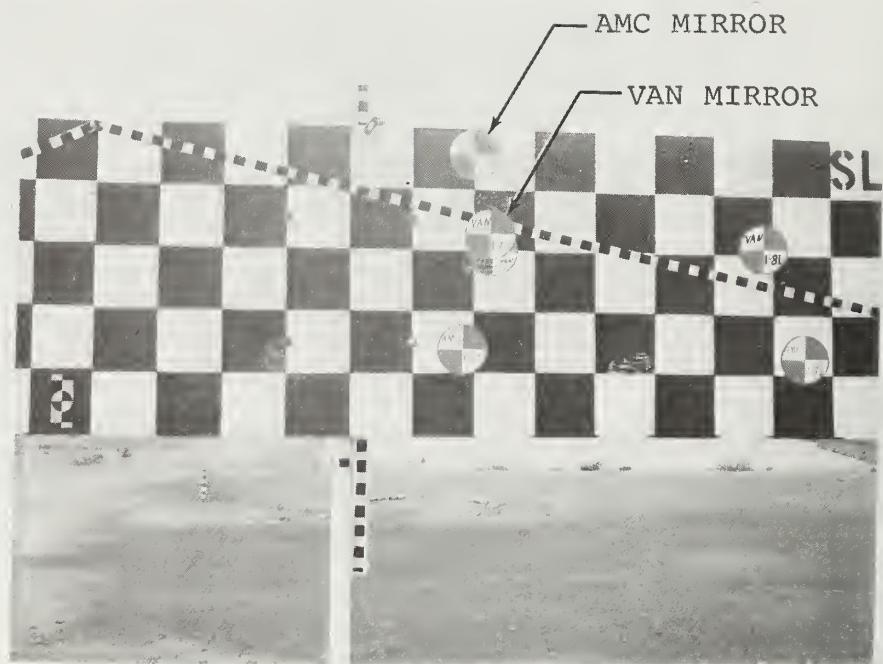


Figure E-25. Ford Econoline E-100 Left Outside Mirror Positioning Repeatability Targets (as a Passenger Car, Target SL) Test 1.

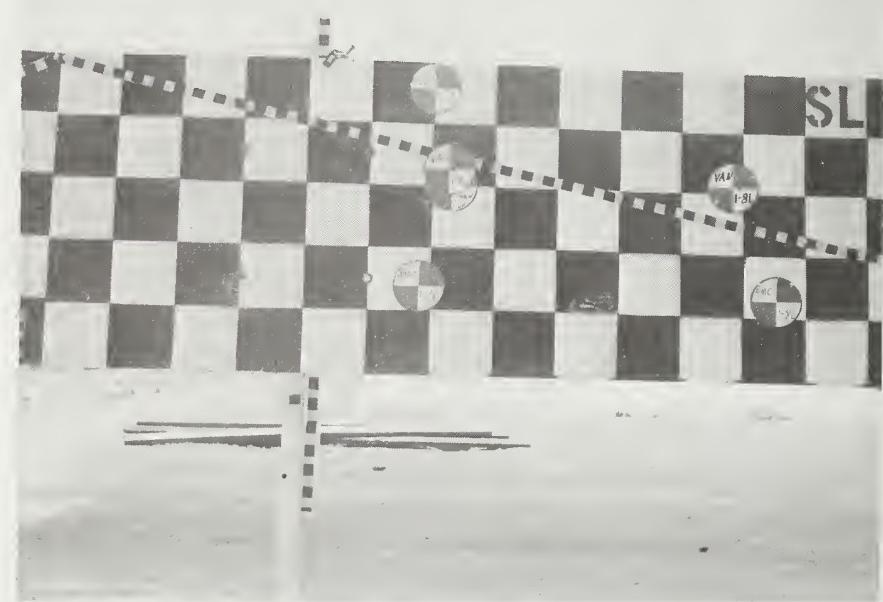


Figure E-26. Ford Econoline E-100 Left Outside Mirror Positioning Repeatability Targets (as a Passenger Car, Target SL) Test 2.

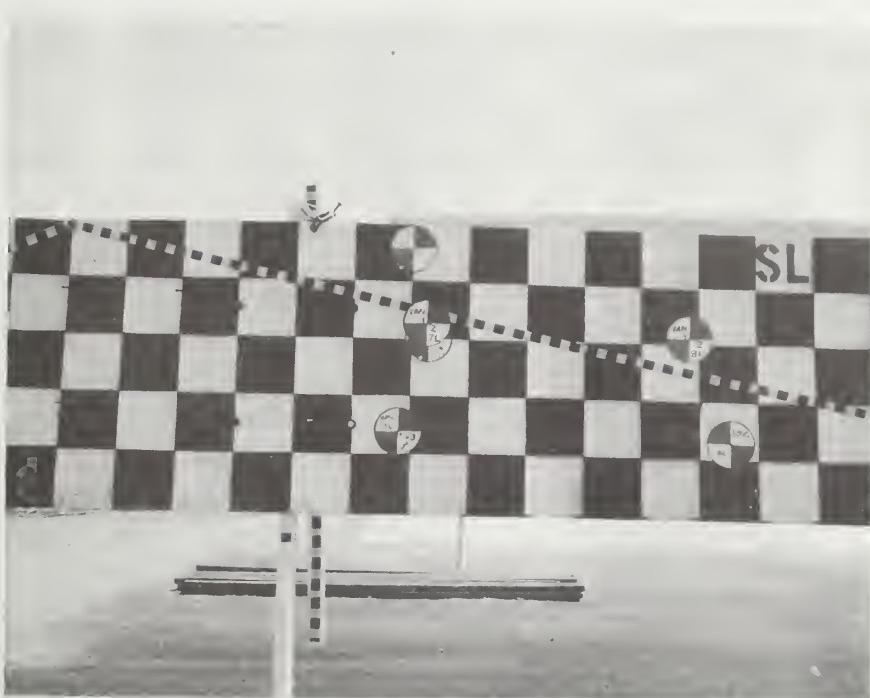


Figure E-27. Ford Econoline E-100 Left Outside Mirror Positioning Repeatability Targets (as a Passenger Car, Target SL) Test 3.

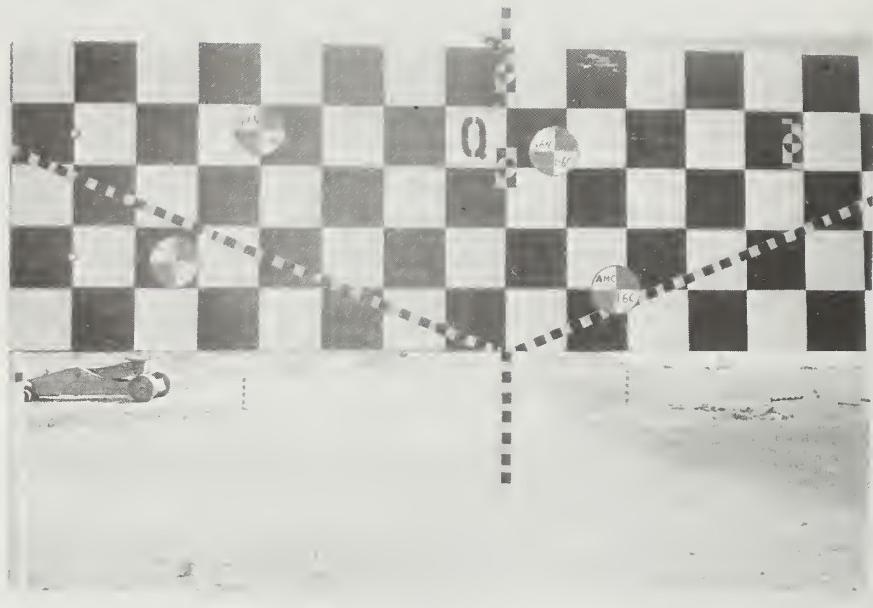


Figure E-28. Ford Econoline E-100 Interior Rearview Mirror Positioning Repeatability Targets (Target Q) Test 1.

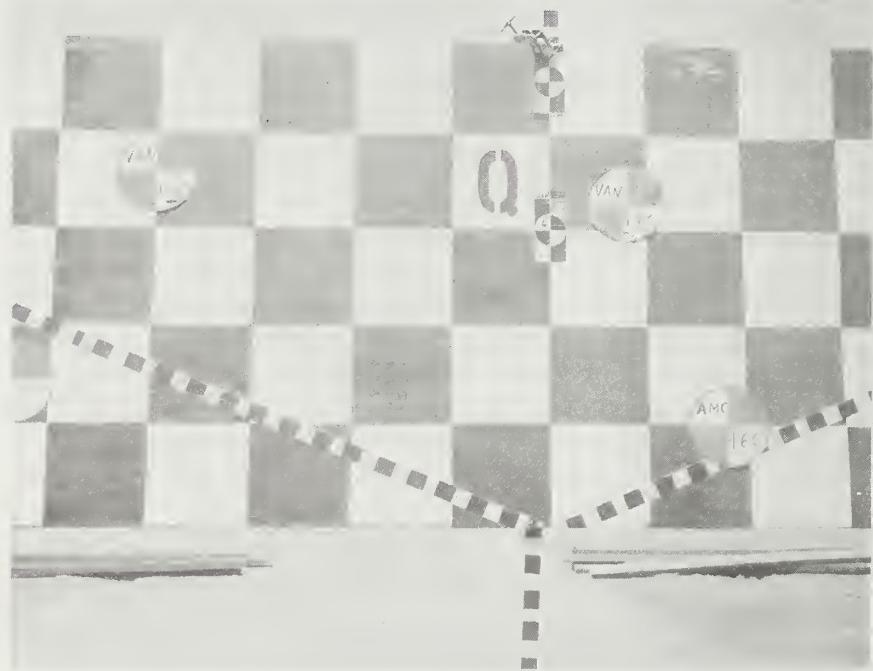


Figure E-29. Ford Econoline E-100 Interior Rearview Mirror Positioning Repeatability Targets (Target Q) Test 2.

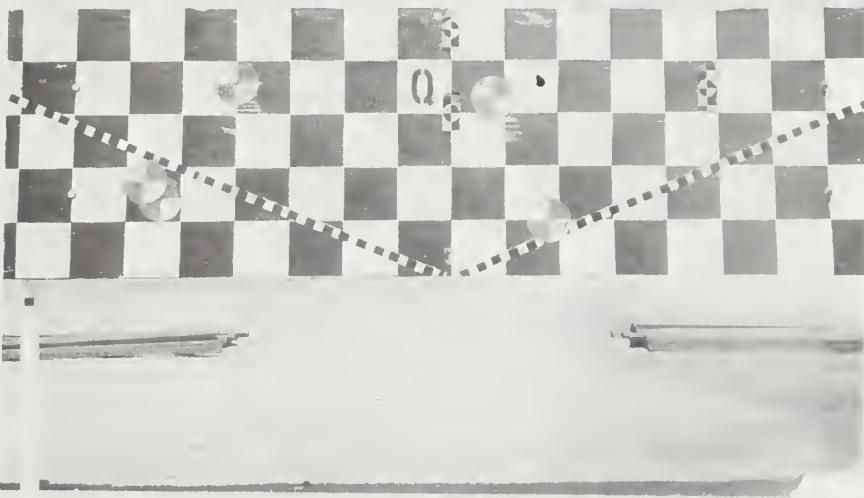


Figure E-30. Ford Econoline E-100 Interior Rearview Mirror Positioning Repeatability Targets (Target Q) Test 3.

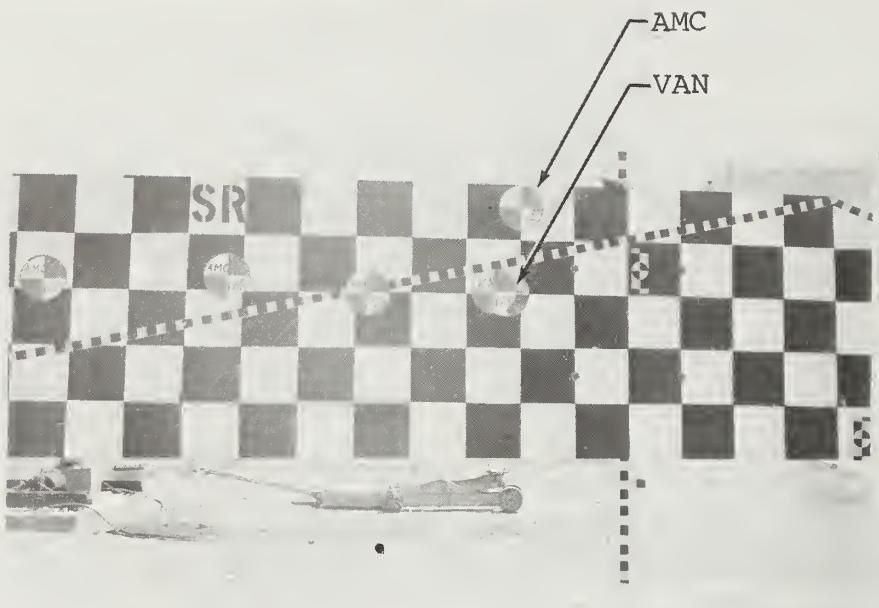


Figure E-31. Ford Econoline E-100 Right Outside Mirror Positioning Repeatability Targets (as a Passenger Car, Target SR) Test 1.

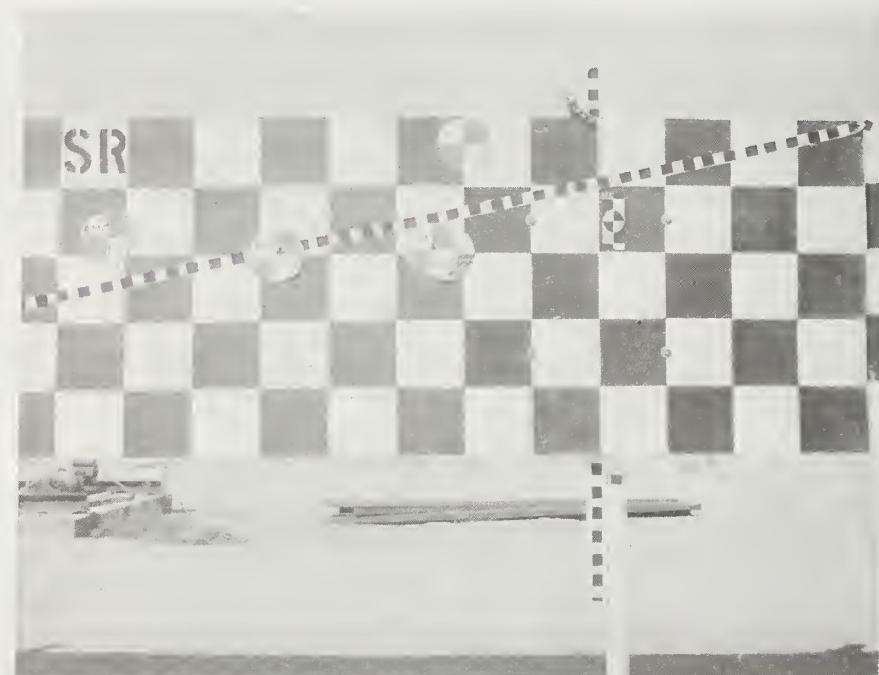


Figure E-32. Ford Econoline E-100 Right Outside Mirror Positioning Repeatability Targets (as a Passenger Car, Target SR) Test 2.



Figure E-33. Ford Econoline E-100 Right Outside Mirror Positioning Repeatability Targets (as a Passenger Car, Target SR) Test 3.

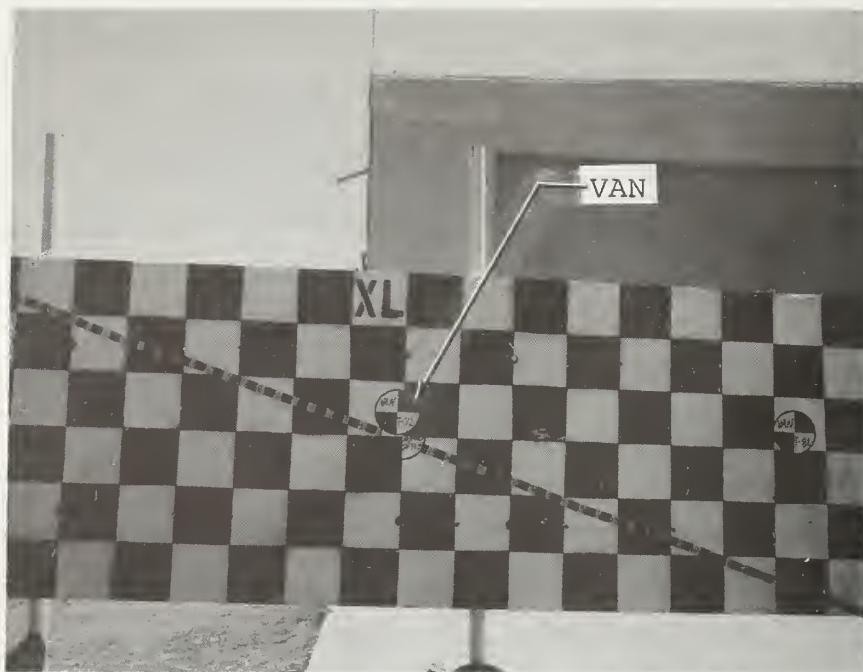


Figure E-34. Ford Econoline E-100 Left Outside Unit Mirror Positioning Repeatability Target (as a Truck, Target XL) Test 1.

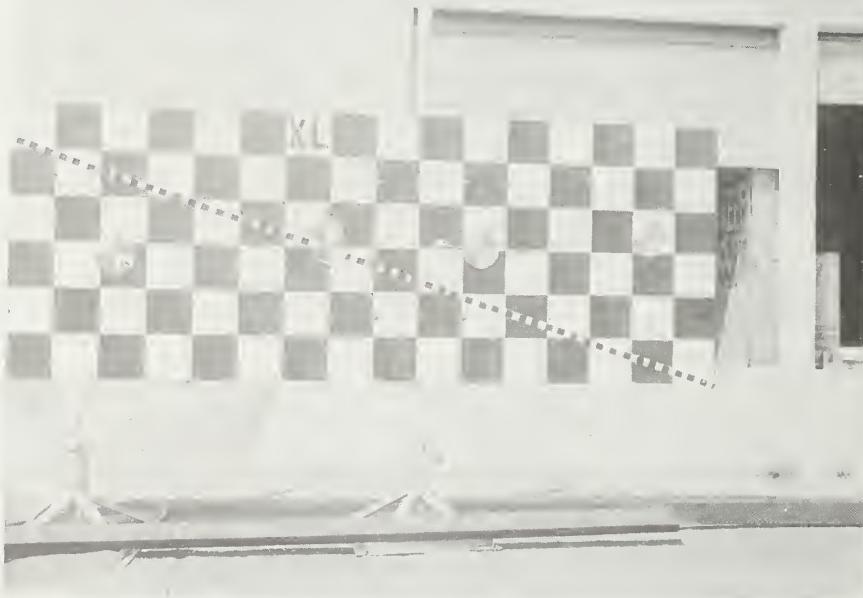


Figure E-35. Ford Econoline E-100 Left Outside Unit Mirror Positioning Repeatability Target (as a Truck, Target XL) Test 2.

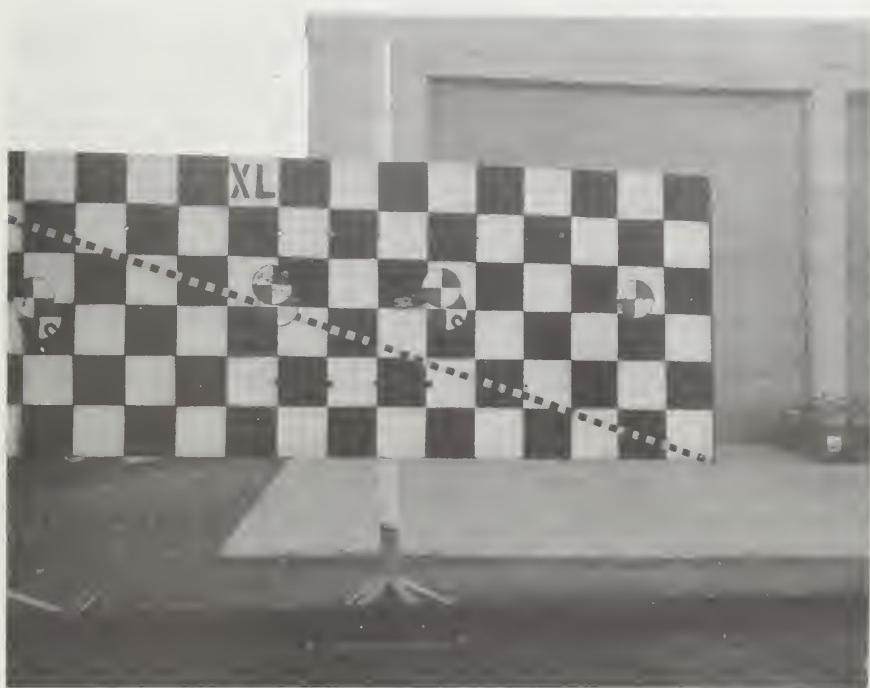


Figure E-36. Ford Econoline E-100 Left Outside Unit Mirror Positioning Repeatability Target (as a Truck, Target XL) Test 3.

909E0606

EYEPOINT 8L

EYEPOINT 7L



Figure E-37. Ford Van Mirror Setup Repeatability - Left Outside Unit Mirror.

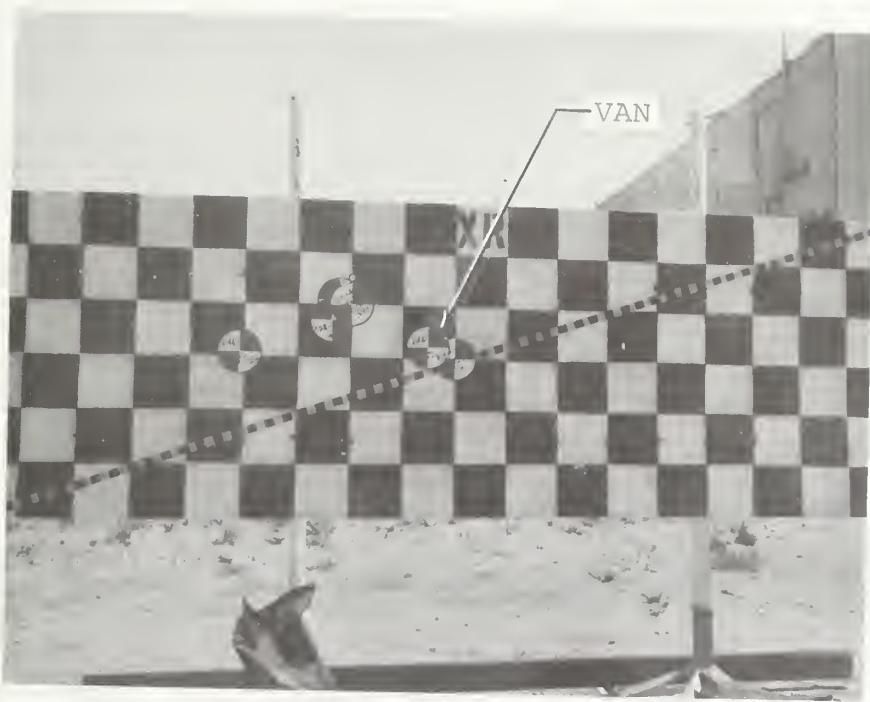


Figure E-38. Ford Econoline E-100 Right Outside Unit Mirror Positioning Repeatability Target (as a Truck, Target XR) Test 1.

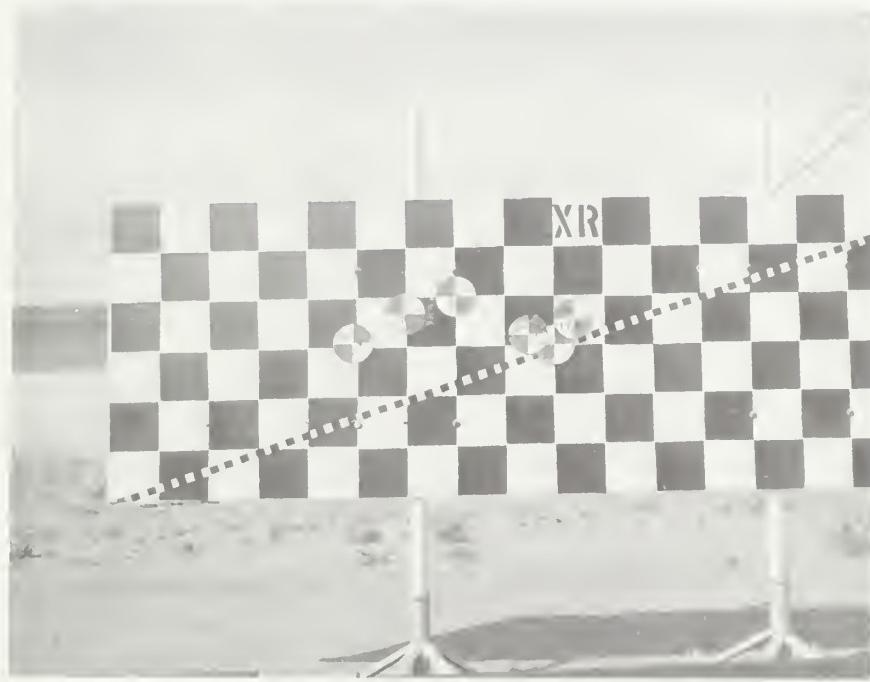


Figure E-39. Ford Econoline E-100 Right Outside Unit Mirror Positioning Repeatability Target (as a Truck, Target XR) Test 2.



Figure E-40. Ford Econoline E-100 Right Outside Unit Mirror Positioning Repeatability Target (as a Truck, Target XR) Test 3.

EYEPOINT 5R

EYEPOINT 6R

6 0980606

EYEPOINT 5R

EYEPOINT 6R



Figure E-41. Ford Van Mirror Setup Repeatability - Right Outside Unit Mirror.

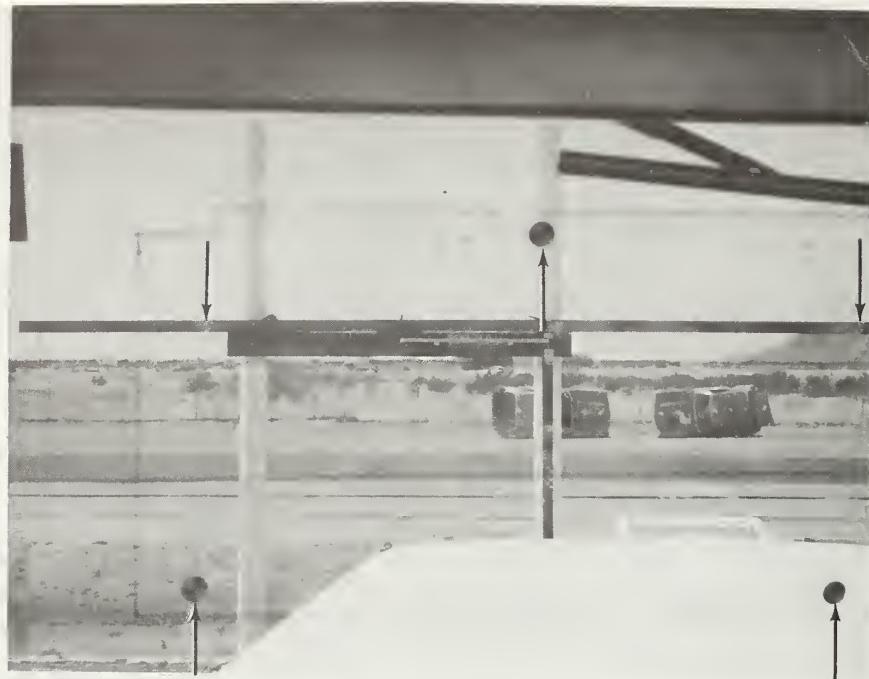


Figure E-42. IHC Tractor Front Targets Representing Vehicle Position Repeatability Test 1.



Figure E-43. IHC Tractor Front Targets Representing Vehicle Position Repeatability Test 2.



Figure E-44. IHC Tractor Front Targets Representing Vehicle Position Repeatability Test 3.

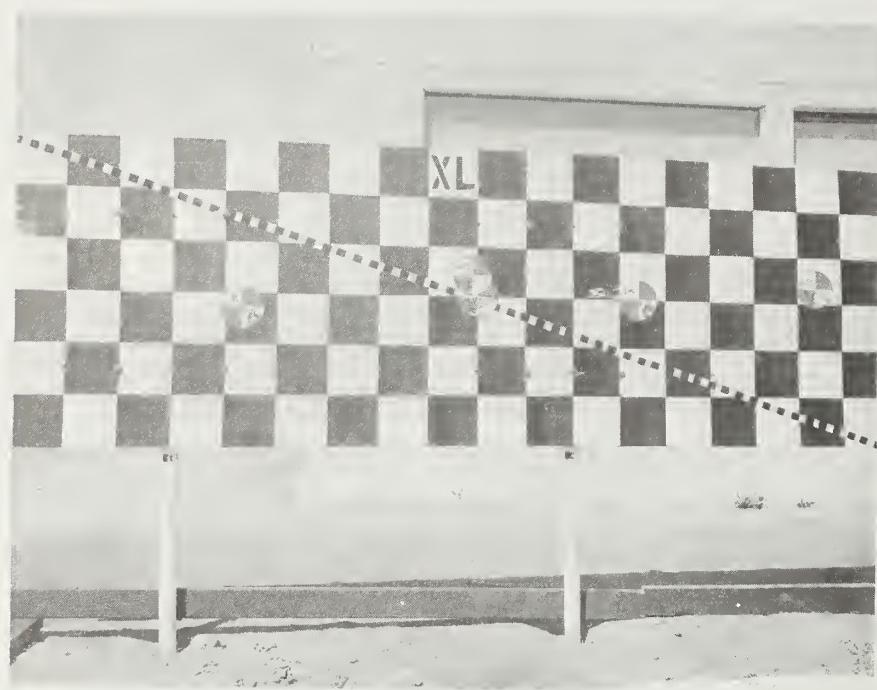


Figure E-45. IHC Tractor Left Outside Flat Mirror Positioning Repeatability Targets Test 1.

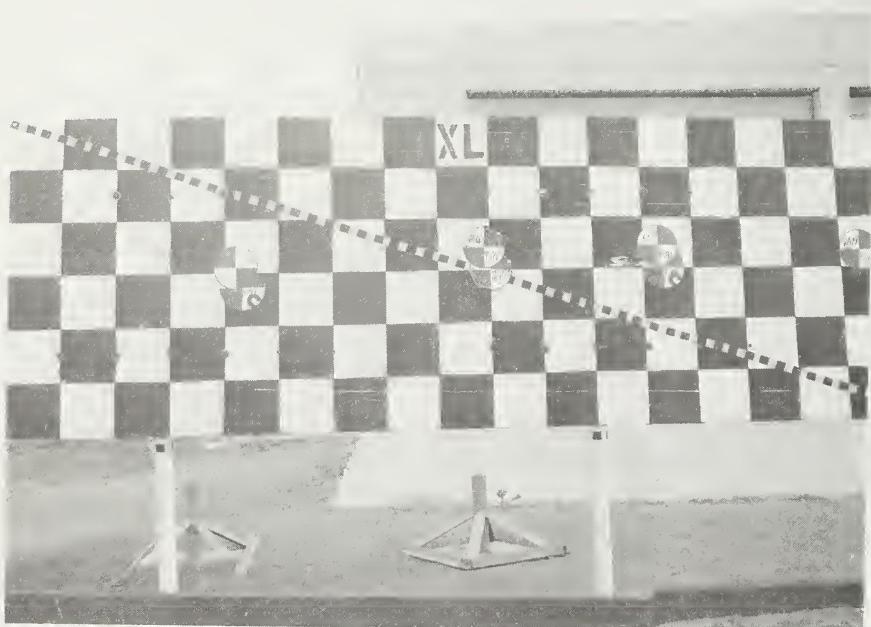


Figure E-46. IHC Tractor Left Outside Flat Mirror Positioning Repeatability Targets Test 2.



Figure E-47. IHC Tractor Left Outside Flat Mirror Positioning Repeatability Targets Test 3.

E 09 E 06 06

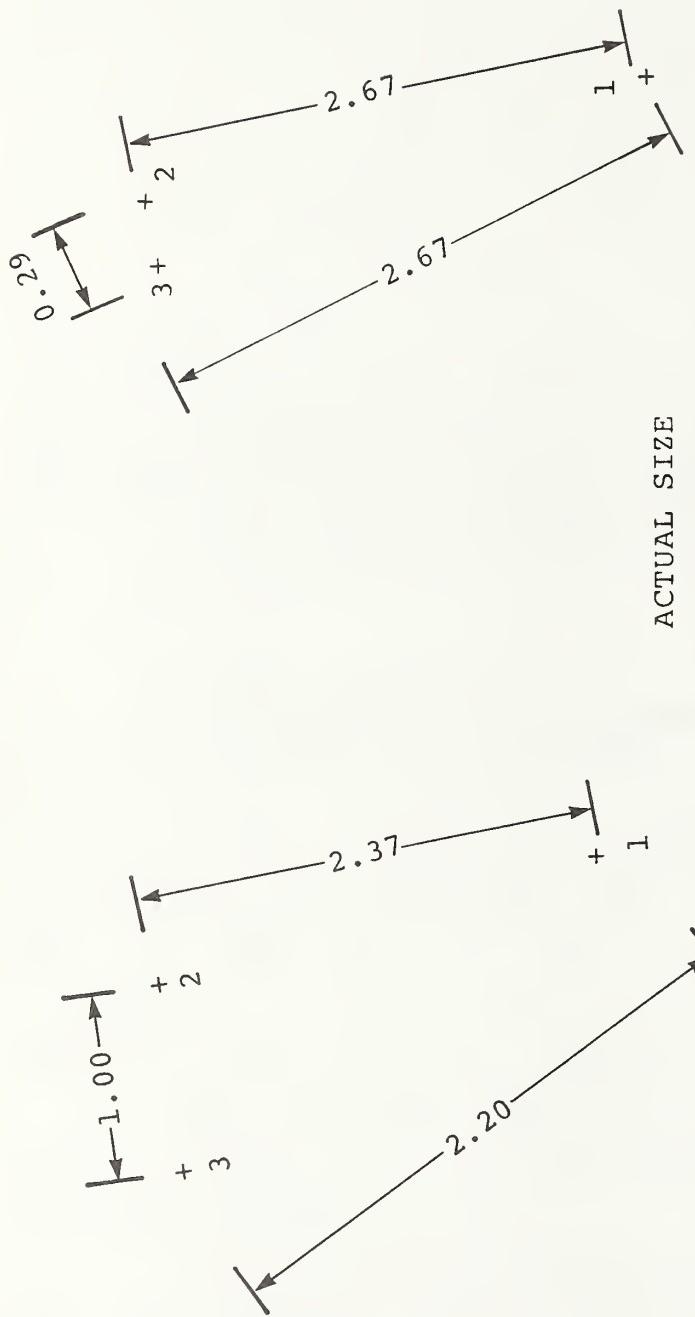


Figure E-48. IHC Tractor Mirror Setup Repeatability - Left Outside Unit Mirror.

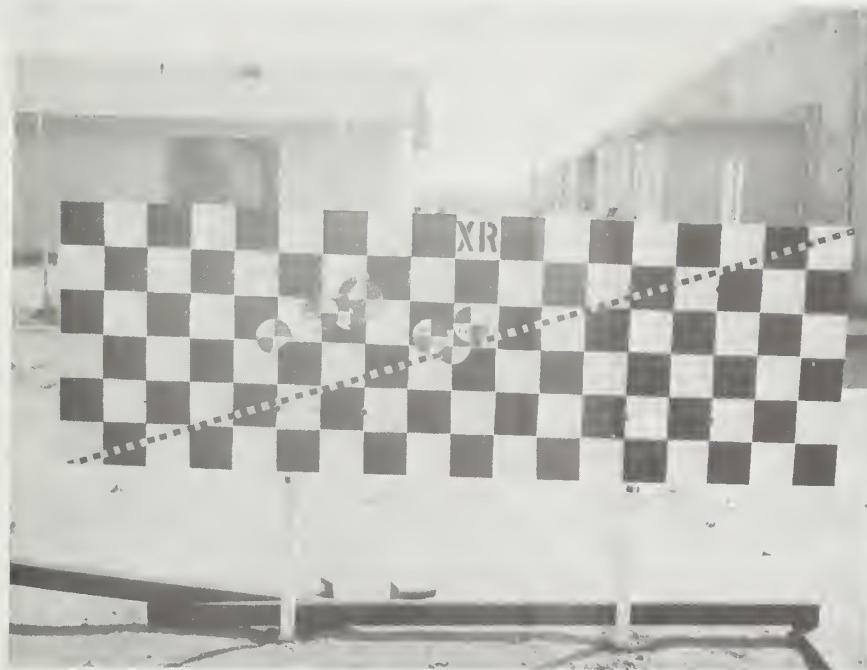


Figure E-49. IHC Tractor Right Outside Unit Mirror Positioning Repeatability Targets Test 1.



Figure E-50. IHC Tractor Right Outside Unit Mirror Positioning Repeatability Targets Test 2.

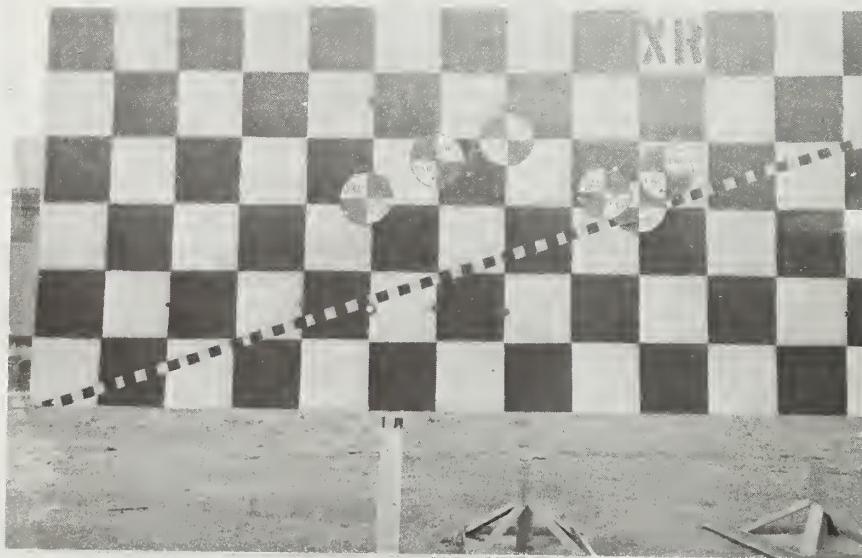


Figure E-51. IHC Tractor Right Outside Unit Mirror Positioning Repeatability Targets Test 3.

S 09 E 06 06

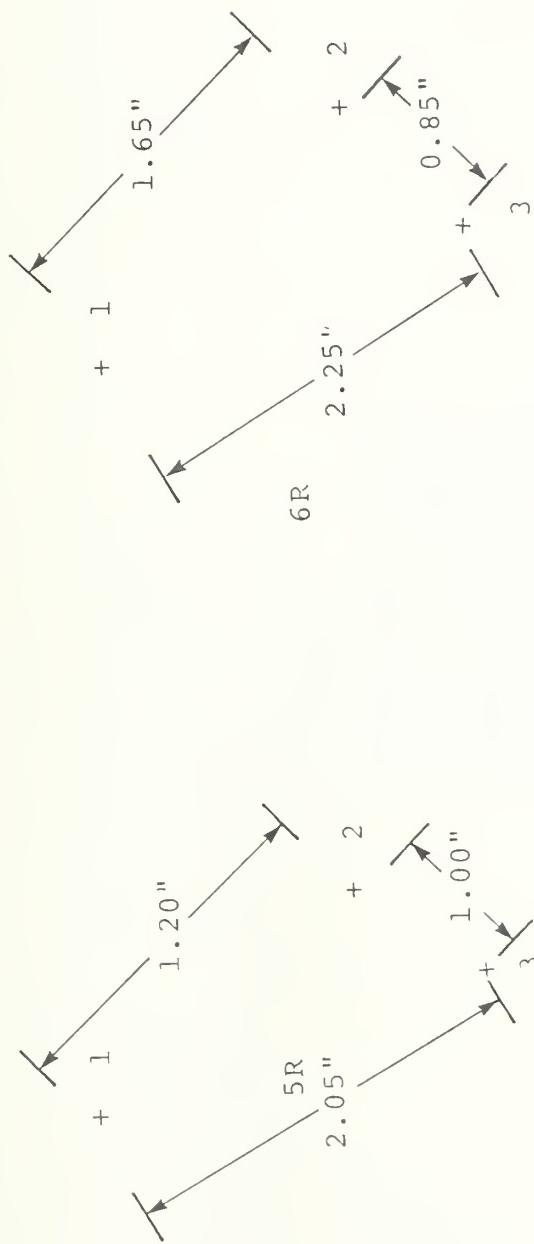


Figure E-52. IHC Tractor Mirror Setup Repeatability - Right Outside Unit Mirror.

AS SEEN FROM E5  
AS SEEN FROM E6



TL 242 • E778

Enserink, E.

Repeatability of  
tests.

Form DOT F 1720.2 (8-70)  
FORMERLY FORM DOT F 1700.11.1

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